



DEVELOPMENT OF MATHEMATICAL MODEL OF THERMOANEMOMETRIC FLOWMETER FOR MEASURING THE FLOW OF BIOFUEL

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The paper deals with today's existing instruments for measuring the flow of fluid and fuel, their classification is given. The structure and operating principle of a thermoanemometric flowmeter for measuring the biofuel flow was analyzed. A mathematical model of a temperature field in the biofuel flow was developed. It allows accurately determine the flow. The corresponding modeling was carried out. It was found that the volume fuel flow depends on the thermocouple temperature measurement errors in the range of relative errors from 0,01 to 1,0 %. For improving the performance of the thermoanemometric flowmeter, a special neuroprocessor that will compensate for random and dynamic measurement errors using artificial neural networks should be included to the computer architecture. The error of measuring the fuel flow will be less than 1 % when the measurement error of the heater temperature is 1%. The results can be applied in the design of new highly precise thermoanemometric flowmeters for measuring the biofuel flow.

Keywords: thermoanemometer, flowmeter, flow, modeling, bio-fuel, flow, heat transfer, thermal conductivity.

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PROCESS AND ACTIVITIES OF THE «UNIT OF ACTIVITY» — TWO FORMS OF THE ORGANIZED WHOLE

page 9–13

The problem of studying the form of relations among the categories of «process» and activities of the «unit of activity» was considered. To comprehend the form of these relationships, it was proposed to consider the contents of these categories using the general methodological (philosophical) categories, introduced by B. Spinoza and G. Hegel in their logical methods.

Based on this approach, the contents of the categories of «process» and activities of the «unit of activity» as physical and organized (having purposeful behavior) wholes, as well as the principle of the relationship among the parts of the specified wholes — the principle of the dialectical unity of the «common» and «single» were identified. Also, the contents of the implementation mechanisms of these relations, namely the motion implementation mechanism for the ca-

tegory of «process» and the «correspondence» realization mechanism for the category of the «unit of activity» were investigated.

Based on this approach, the principle of the relationship among the process implementation results and activities of the «unit of activity» — the principle of dialectical unity — «single» and «general» was also disclosed.

To study the activities of targeted systems, the content of their performance indicators is important. It was proposed to include the following parameters — strategy, goals, objectives and result indicators for a specified time (or time period) in the category of «future result project» for the activities of the «unit of activity». This ensures the unambiguity of their definition, and therefore implementation.

The research results are of interest to specialists in the field of systems theory and systems analysis. Disclosure of the contents of the categories of «process» and activities of the «unit of activity» as wholes, consisting of parts, and motion and correspondence ensuring mechanisms allows to use functional systems theory results for the activity model development in the general enterprise theory.

Keywords: system, whole, activity, integrity, category, concept, mechanism, motion, management, correspondence.

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THE IMPROVEMENT OF TRAIN FORMATION INTERACTION ON TECHNICAL STATIONS WITH TRAIN SCHEDULE

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It is shown that one of the measures to ensure the effectiveness and reliability of the schedule is use of flexible weighted norms. As a result of working conditions research of railway yards at sending of trains using flexible standards of weight and length of train will be found that flexible train formation management will reduce the interoperable down time, including downtime of trains awaiting departure at 60–80 %.

Irregularity reducing favorably affects both their performance and the performance of those companies that it serves. Therefore, in order to keep the constant movement size on the assumption of uniform departure of trains is advisable to reduce the minimum, or increase the maximum norm.

Implementation of freight trains movement technology according to schedule is better starting with sites and directions with stable train flows.

Keywords: train formation, railway yard, train schedule, train downtime.

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IMPROVEMENT OF A METHOD FOR CALCULATING THE GATE INSULATION MONITORING CIRCUIT 3B WITH TWO-COIL MEASURING RELAY

page 17–21

Efficiency of protective shutdown of electrical installations is identified with the level of risk of electric shock, reached in them, and this level is determined by the following parameters.

The first is compliance of protective characteristics of RCD with the electrical safety requirements, the second is the ability to retain this correspondence under all occurring negative impacts of production factors, and the third is the ability to provide a functional interaction of leakage relay and power switching network device, included in the RCD. The second and third parameters are determined based on compliance with the RCD requirements, imposed by the operating conditions of mining production.

The paper presents an improved method for calculating the gate insulation monitoring circuit 3B with two-coil measuring relay. As a result of the research, a new calculation method was proposed and optimization of parameters of AIMD-380 circuit was performed in order to increase its sensitivity from 0,33 to 0,63 mA/kOhm with the same functional characteristics.

The research results will enhance the reliability of the leakage relay, thus improve the protection of people against electric shock in LV networks with insulated neutral and reduce the risk of ignition of fire-damp and coal dust by leakage currents.

Keywords: leakage relay, sensitivity of circuit, coil, valve, insulation, relay operation, current.

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CALCULATION ALGORITHM DEVELOPMENT OF PULLING ABILITY OF DRIVEGEAR AND CONVEYOR BELT TENSIONERS

page 21–24

The article is devoted to development an algorithm and software for automated calculation of the conveyor tractive factor value. The basis is known calculation method, it is discussed various variants of conveyor - single and double-drum, with clamping roller or tape, hard kinematical or independent connection between drums. It is formalized the second stage of automated design problem of mining conveyors, using known methods approved by Standard.

A visual form for user interface based on example of basic parameters of the mine conveyor that was created in the Visual Basic for Application programming language. Visual Basic for Application programming language, built-in MS Office package, is used for automate the calculation of these conveyor parameters, the visual form of algorithm realization calculating of the traction drive capacity conveyor drive gear pulling ability is developed.

Depending on the number of drums, used in the conveyor, it is chosen the mode and type of drive. For single-drum drive gear is chosen the classic drive gear: with clamping roller or clamping tape. For double-drum drive gear is chosen the drive gear type: with hard kinematical or independent connection between drums.

Keywords: conveyor, parameters, tractive factor, standard, specifications, algorithm, software.

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THE STRUCTURAL AND CLASSIFICATION ANALYSIS IN THE REGION COMPETITIVE CAPACITY MANAGEMENT

page 24–30

The article focuses on the notion of the territory strategic management as a complex open system consisting of subsystems, which should be presented as a series of tasks formed by means of semantic, methodological and information signs and interconnected by direct and inverse information flows of different speed.

The authors consider the methodology of the structural classification of objects system parameters, which form a competitive area, with the use of the method of inductive production functions approximation, which is presented on the basis of lump and linear approximation of the elementary combined expending functions with their additive and sequential combining into a single mathematical instrument.

Integrated assessment procedure allows to set some divergences according to certain criteria. Due to the reduction scale identification the relative quantities of allowable errors can be extended to the integral indices. After a dosated approximation of expending functions lump and linear view and the use of inductive production function can be considered.

An important issue is the definition of the classification quality criteria based on the characteristics of intermediate proximity of the points in classes and the average proximity (distance) of the classes themselves.

Keywords: strategic territory management, stable development of the economic system, structural classification, lump and linear approximation.

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GEOMETRIC ALGORITHMS FOR CREATING ORNAMENTAL FILLINGS IN COMPUTER DESIGN OF STAINED GLASS

page 30–35

The importance and basic types of ornamental stained glass filling and its most common historical schemes are described in the paper. Historical factors of stained glass technique and the main stylistic features in the regional-historical context were disclosed. The basic geometric algorithms for creating the majority of the most commonly used ornamental fillings, needed to design artistic two-dimensional stained glass, and the means of their parametric setting in computer design of stained glass panels were determined.

Design of two-dimensional stained glass panel by traditional methods is rather laborious and time-consuming process. Often, several experts were involved in these projects. For example, draftsman, glass engraver and glass-artist, who knows the assembly peculiarities of the panel. In the case of ornamental filling, sometimes mathematical calculations, applied in each case individually were enough. In the case of developing a computer design system, such a project will be created by setting up several parameters. As a result of the studies, geometric algorithms to obtain the scheme of connecting grid for the basic styles of ornamental filling of stained panel were designed. Such technology will significantly reduce the project creation time and greatly expand the range of users, even those not familiar with the peculiarities of the stained glass technique, such as designers, architects and artists.

Keywords: stained glass panel, geometric-ornamental filling, cross section of connecting profile, parametricity.

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CONSTRUCTION OF LINEAR DIFFERENTIAL EQUATIONS OF THE FERMENTER SHELL OF ARBITRARY SHAPE IN THE ULTRASONIC FIELD

page 35–39

A computational model of an elastic interaction of the external ultrasonic radiation with the fermenter body is constructed.

The linear differential equations of a thin shell under the assumption of arbitrary shape of the ultrasonic beam, which subsequently allow to determine the coordinate functions of the shell along its length, along a parallel and transversely are composed.

A system of linear differential equations of the dynamics of the fermenter shell was constructed. As a special case, equations of classical cylinder were obtained. To find the coordinate functions, approximate integration methods, in particular, the variable separation method, are used. The nature of the appearance of active energy state zones in the culture broth due to the radiation of sound waves by the fermenter body is explained. Conditions for the occurrence of local features in the liquid at the resonance level in the form of two caustic surfaces, concentric with the body – large and small radius were analytically outlined.

Studies are related to the pharmaceutical industry, production of liquid medications.

The results allow the process automation, product quality improvement and productivity increase.

Keywords: meridian line, coordinate functions, elastic displacements, parallel, shell, fermenter, features.

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EFFICIENCY DETERMINATION OF THE METHOD «SPECIAL LANE IN THE INTERSECTION AREA» FROM THE STANDPOINT OF PRIORITY IN TIME

page 40–45

Using the space-time priority and priority in time at the isolated signal-controlled intersection with one traffic lane on all approaches is considered in the paper. Space-time priority is represented by the method «special lane in the intersection area», which in this case is a combination of a special lane in the intersection area and adaptive algorithm for a special phase call. Priority in time is realized using the algorithm for continuation of the enable signal and early termination of the disable signal. Using VISSIM software, the efficiency of these algorithms under different traffic conditions at the intersection is determined. The most effective application scope of the method «special lane in the intersection area», where priority in time is implemented using the algorithm for the special phase call is defined.

Keywords: priority ensuring algorithm, special lane, bus, signal-controlled intersection.

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TECHNOLOGY AND EQUIPMENT MODERNIZATION OF ROLLING PROCESS ON WIDE-STRIP MILLS OF THE FIRST GENERATION

page 46–51

The existing technologies of hot strip production in the mills of different generations are considered in the article on the basis of literary analysis, the major disadvantages are identified and development trends of wide-strip hot mills are determined. The outmoded and physically worn-out equipment is used in continuous wide-strip

mills 1700 of Illich Iron and Steel Works in of Mariupol. To prolong the life of the equipment and the maintenance of competitiveness requires the equipment reconstruction and improving the technology of hot rolling of wide strips.

The practical recommendations to improve the technology and mechanical equipment for the production of hot-rolled wide strips in condition of WSHM 1700 of Illich Iron and Steel Works in of Mariupol are proposed in the article. The proposed solutions will address the following actual tasks: the expansion of the product assortment, improving its quality with resource-saving and material-saving and, consequently, effectiveness increase of specific industrial enterprises.

Keywords: hot rolling of strips, hydraulic pressure device, assortment, technological process.

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THE FORMULATION OF THE FOUNDATIONS FOR PROBABILISTIC MODELING AND EVALUATION OF MEDICAL SERVICE QUALITY

page 51–55

Analysis of theoretical and applied aspects in the construction of decision support systems and peculiarities of decision making process in medicine is given in the article.

The elements of information system (IS) for medical field are made on the results of work. Conditions for the automatic selection of the optimal algorithm for solving the problem of patient diagnosing are made in this system with the help of the domain model (ontology) and an adequate knowledge base. It is found that the results of the system design of decision support and making for treatment decisions with the system of relations for quality estimation of diagnosis procedure based on functional qualities give a physician the opportunity to raise the level of skilled care and effectiveness of drug therapy choice for treatment of various disease types of patients.

Keywords: quality estimation, medical service, modeling, diagnostics, probability.

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STUDY OF GENERAL TRENDS OF MODERN DEVELOPMENT OF AMMONIA PRODUCTION

page 55–60

The evolution stages of synthetic ammonia production were considered in the paper. In the context of these stages, according to the results of analytical studies, general development trends of ammonia production in the present conditions, in particular for Ukraine, which cover both problems and individual tasks, required for overcoming and solving them were analyzed and determined. It was shown that the need to solve food program is associated with the trend of ever-increasing nitrogen fertilizers production volume, both in the world and in Ukraine, which is accompanied by a corresponding increase in the ammonia production volume. It was proved that, in the coming decades, the natural gas will continue to be the main raw material in the ammonia production technology. Herewith, a tendency to increase their energy efficiency by upgrading instrumental-technological design of the most energy intensive stages, in particular ammonia condensation, in order to reduce electricity and natural gas consumption rates, which can be achieved by utilizing low-grade heat of flows with the temperature less than 100 °C is especially relevant for domestic units. The latter can be achieved by using steam-ejector refrigeration systems.

Keywords: ammonia production, evolution, community trends, analytical studies.

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RESEARCH OF THE PURIFICATION PROCESS OF FARMLAND OIL-CONTAINING WATER

page 61–65

The feasibility of oil-containing water purification by secondary emulsification is grounded to reduce contamination of ground-water in agricultural bases of fuels and lubricants and in the surrounding areas. The laboratory unit and research method of oil-containing water purification are developed. According to the results of experimental researches it is determined the optimal structural and operating parameters of unit for oil-contained water purification. The dependence of oil-containing waterpurification efficiency by the combination of methods of coalescence and liquid filtration from the concentration of oil products, surfactant and water salinity is determined. The principles for design of water purification equipment, the principle of which is based on a combination of coalescence, liquid filtration and the action of electric field are proposed. The process flow sheet of farmland oil-containing water purification is proposed. Implementation of the research results will reduce the negative impact of human factors in the use of agricultural land.

Keywords: oil-containing water, coalescence, filtrate, oxidation, kinetic reaction, electric field force lines, filtration rate.

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DURABILITY INCREASE OF GEAR PUMPS IN AGRICULTURAL MACHINERY

page 65–69

The analysis of the literature on the issue of durability performance providing of gear pump tribocoupling of tractor hydraulic system is made. The laboratory unit and optimal composition of cutting fluid with antifriction additives for tribocoupling condition research is proposed. According to experimental results it is determined that the efficiency improvement of pump tribocoupling is due to the optimal composition of cutting fluid with antifriction additives. The optimal structure of the basis for additives is determined. A comparative study on the friction machine showed the improvement of tribocoupling properties of samples that were processed by piercing using cutting fluid with antifriction additives. It is determined that the use of antifriction additives decreases the friction torque, increases wear resistance and load setting, accelerates the grinding process of the tribocoupling friction pair details of HIII-32-Y pump. The technology of economically and efficiently carrying out of plugs pump restoration through the use of combined piercing and antifriction additives in cutting fluid is grounded and shown.

Keywords: cutting fluid, antifriction additives, friction details, durability, hydraulic system, tribocoupling.

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MATHEMATICAL MODELLING OF INDUSTRIAL ENTERPRISE LOGISTICS WITH DIFFERENT OPTIONS OF BASIC INFORMATION

page 69–75

The reasons of the low effectiveness of warehousing models with deficit and their construction are investigated and analyzed. It is not taken into account that the cost of delivery and storage, as well as penalties of shortages related to different moments in time in determining the function form of the general costs in models with a deficit. The deficit size and the financial losses from its inception is incorrectly defined. The combination of these observations is one of the main factors affecting the adequacy of mathematical models of inventory management with a deficit.

Mathematical models based on the principle of incoming and outgoing financial flows reduction to one moment of time led to the following conclusions: non-compensable deficit allowing is economically inefficient; for «large» penalties from a deficit the compensated deficit allow economically inefficient; the compensated deficit is planned for «small» penalties from a deficit. The planning results differ significantly from the results obtained using the existing model.

Using the developed mathematical models will help make the best decisions in warehouse logistics. Remarks on the model construction with a deficit can be used for other models of inventory management that will create an effective information logistics system.

Keywords: information system, logistics, mathematical models, compensated and an uncompensated deficit optimization.

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