DEVELOPMENT OF DATA STRUCTURE OF INFORMATION TECHNOLOGY OF GROUP SPECTRUM-CURRENT DIAGNOSIS OF INDUCTION MOTORS

page 4–8

For monitoring the current status of electrical equipment, the information technology of a group spectrum-current diagnosis of induction motors is proposed. The proposed technology is based on the process of obtaining information about the objects under investigation by analyzing the current spectrum of consuming electrical network. The process of obtaining and further processing of data is considered in the paper. The structure of the database and knowledge base of an expert system as a part of a decision support system for monitoring the current status of induction motors is given. As a result of the conducted studies, the analysis of information processes in the decision support system (DSS) of the information technology of the group spectrum-current diagnosis of induction motors (IM) is made. As a result, the algorithm of the database management system operation (DBMS) for sustainable recording, storing and processing of the necessary data is formed. The structure of the database and knowledge base is developed. The obtained structures of the database and knowledge base can be used in the implementation of systems for monitoring the current status of induction motors based on the spectrum-current diagnosis.

Keywords: database, knowledge base, induction motor, monitoring, information technology.

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THE ALGORITHMIC MODEL OF INFORMATION TECHNOLOGY FOR FORMING STRATEGIC PORTFOLIO OF ENTERPRISE GOODS

page 8–11

Enterprise with the incremental style of behavior, conducting business activity in conditions of dynamic competitive environment, characterized by instability of its main factors and their uncertainty in time is considered. The problem of an adequate algorithmic model for forming a strategic portfolio of enterprise goods, which satisfies the system requirements to achieving the set strategic goals by the enterprise is solved. Algorithmic model integrates qualitative and quantitative methods for modeling enterprise business activity; contains algorithmic models of expert procedures for determining the morphology of the strategic portfolio of goods, ranking strategic goods by risks, as well as an algorithmic model for determining the optimal structure of the strategic portfolio of enterprise goods. The proposed algorithmic model is the theoretical basis of information technology that automates forming an effective strategic portfolio of goods, information and analytical decision support in the strategic management of the functioning and development of modern enterprises. The features of creating information technology based on the proposed model are considered.

Keywords: enterprise, algorithmic model, strategic portfolio of goods, information technology.

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CONSTRUCTION OF MATHEMATICAL MODEL OF THE DRYING PROCESS POLYETHYLENE TEREPHTHALATE GRANULATE

page 12–16

The paper presents the results of experiments on the optimum conditions of the drying process of PET granulate. The results of experiment on isothermal drying of granules are presented. It is necessary for the management mode for drying the granules and further processing.

The results of designed of research show that the process of drying the PET granulate is nonlinear. Thus there is structural alteration of polymer which accompanies the deep (to 0,005 %) moving away of moisture from him, that predetermines stability of further technological process. After the analysis of experiments, we concluded that to achieve the desired moisture content must be chough four hours of drying process.

The mathematical model of the process of drying the granulate based on multivariate experiment indicates that the greatest influence on the drying process have such factors as: the time of process passage, the drying temperature and the grain diameter of the material.

Established during the experiment to the optimum drying mode (temperature and time of the process) that will help in saving energy and material resources for companies operating in this area.

Keywords: polyethylene terephthalate, PET packaging, drying the granules, the mathematical model, moisture content, dryer.

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DEVELOPING AN INTEGRATED APPROACH TO FORMATION OF CURVES AND SURFACES OF REAL SPACE BASED ON ISOTROPIC CHARACTERISTICS

page 17–20

The principle of forming curves and surfaces based on imaginary properties is considered in the paper. The main objective lies in developing a new integrated approach to modeling three-dimensional real space objects at preset zero characteristics. An algorithm of forming curves and surfaces is proposed, and isotropic characteristics are considered. For modeling isotropic curves isotropic intervals, polygons, an isotropic curve length, isotropic curvature and torsion are used. For modeling isotropic networks on a plane and a surface in three-dimensional space, the kinematic construction method is used. Curves with assigned isotropic characteristics are selected as directors and generators. For representing the obtained objects, real and imaginary parts are designated, and then obtained abstractions are studied. The approach was developed for obtaining objects with prescribed metric and differential properties. The studies can be used for managing algebraic functions at conformal mappings, in the theory of a thin-walled structure bending.

Keywords: isotropic curve, isotropic curvature, isotropic torsion, isotropic network, zero characteristics.

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NUMERICAL RESEARCH OF STABILITY IN LOTKA-VOLTERRA SYSTEMS WITH PERTURBED RIGHT SIDE

page 20–22

The basic effects and patterns that characterize the model of co-existence of two species with weak sinusoidal external effect on the reproduction rate are considered. Solving Lotka-Volterra differential equations describes the ecosystem behavior. Numerical solutions for exposure frequencies, close to the frequency of an unperturbed system cycle are found. The stability of such a non-autonomous system is studied. It is determined that the periodic effect on the population, for example, by changing nutrition or hunting leads to a non-periodic system dynamics. Various forms of irregular behavior of «predators» and «victims» appear in the phase patterns for similar perturbations. All this confirms that even relatively simple models of ecosystems reveal their instability, i.e., sensitivity to small external perturbations.

The parameters of perturbations, leading in the proximity of resonant perturbation to both non-periodic growth of populations and non-periodic motions over a finite area, or to stabilization around zero, are defined. Herewith, extinction of populations is quite possible. The obtained results can be used by experts in the field of ecology and economy.

Keywords: Lotka-Volterra model, stability problems, phase space.

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NUMERICAL SIMULATION OF CRACK PROPAGATION IN BIMETALLIC SPATIAL STRUCTURES

page 23–27

The chemical industry uses welded bimetallic vessels and apparatuses that periodically run repair process. Violating welding procedure may cause defects that may lead to destruction of bimetallic vessels and apparatuses.

There are cases of destruction of bimetallic vessels and apparatuses at loads much lower than planned. Therefore, identifying and investigating defects in the structure at the design stage to prevent accidents by modeling the processes, connected with the destruction is an important issue.

Destruction under comparison has emerged in the case of the distillation column with a diameter of 3200 mm and a wall thickness of 28 mm (in the destruction zone) at a pressure of 1,2 MPa. Herewith, a crack with the length of ~6,6 m and an opening width of up to 120 mm has developed.

The column material is plastic, so the crack development runs within a certain time. Crack propagation process is non-linear and crack development time-dependent, which in turn affects the internal pressure and crack propagation rate.

Air losses are found using the known ratio, which takes into account the loss factor, crack opening surface area, absolute pressure in the column and temperature.

In the paper it was assumed that crack opening growth under Irvine is half of the plastic zone and depends on the tangential stresses in the column, crack length and plastic limit for the column material.

Based on a complex APROKS, a model of crack propagation in bimetallic structures was developed. Numerical simulation of the crack propagation process is carried out in the work by integrating the equations of motion in time depending on the crack development parameters.

The system APROKS can be recommended for practical implementation in the design and operation of equipment for chemical engineering and petroleum industry.

Keywords: destruction, bimetallic distillation column, crack, numerical simulation, APROKS.

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DEVELOPMENT OF THE METHOD FOR DETERMINING THE EFFICIENCY OF DECENTRALIZED HEATING SYSTEM

page 27–31

The main purpose of heating systems is to provide heat consumers with energy of the relevant parameters, therefore, selecting the optimal energy sources is the actual task today. The analysis and the method for calculating the efficiency of decentralized heating system, which consists of the heat generation source, heating pipelines and heat consumer are considered in the paper. The method for calculating the efficiency of decentralized heating system, based on which changes in the coefficient of performance (COP) of boilers and generating facility were experimentally determined taking into account the useful heat of exhaust gases Δq_2^{96} and useful heat in the environment Δq_5^{96} for various types of boilers and their location is developed. In addition, it is shown that with the decentralized system, it is necessary to consider not only the COP of the generating facility, but also the loss of heat energy that can be partially used by heat consumer depending on its location. The method can be used in calculating the effectiveness and economic efficiency of decentralized heating system and designing new heat-energy facilities.

Keywords: decentralized heating system, energy source, heat consumer, system COP

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POSSIBILITIES OF USING ELECTROCHEMICAL TECHNOLOGY FOR MODIFYING PROPERTIES AND WATER QUALITY CONTROL

page 31–33

Using the measured value of the ox-redox potential in the regulation of production processes and product quality control is discussed in the paper. The main purpose of the research is to develop an electrical method and characteristics for rapid and objective evaluation of the quality of process fluids and finished products. With the development of experimental techniques and synthesis of the new chemical compounds, the possibility to develop electrical methods and techniques, which accelerate production processes, replace multistage laboratory studies and ensures accuracy and speed of obtaining the result, has appeared. The analysis of the results of experimental studies of model and real process multicomponent fluids is given in the paper. The dependences of the composition and the degree of oxidation of the liquid components on their consumer properties are obtained.

The method for fast modification of fluid properties by means of the electrical action, which affect the production processes and the finished product quality, is proposed. The electrical characteristic of evaluating the quality of bottled natural drinking water is proposed.

The paper may be of interest to experts in physical chemistry and metrology. The research results can be applied to fluid production diagnostics, finished products composition control, waste and environment monitoring in the food, pharmaceutical and other industries.

Keywords: ox-redox potential, evaluation of natural drinking water quality, process water.

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USE OF INNOVATIVE INFORMATION AND COMMUNICATION TECHNOLOGIES AND MODERN MULTIMEDIA MEANS IN THE EDUCATIONAL PROCESS

page 34–38

The article provides an overview of the theoretical and methodological foundations of information and communication technologies (ICT) in higher education institutions at the present stage; positives and problems of the use of ICT in education are marked; the technique of the use of public multimedia means in educational process in the transition period for implementation of distance education elements into educational processes under difficult economic conditions is considered. It was found that the use of e-learning saves the lecturer's time to prepare for classes, class time, and effectively influences the performance of students while processing theoretical material, fulfilling practical tasks, self-control of knowledge, working with supplementary materials, contributes to achievement of significant results in studies.

Keywords: educational process, distance education, multimedia means, information and communication technology.

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THEORETICAL ANALYSIS OF THE MICROWAVE RADIATION INTERACTION WITH ANIMALS SUFFERING FROM ENDOMETRITIS

page 38–41

Numerous veterinary studies show that electromagnetic treatments of endometritis in cows seems to be quite promising. However, it should be understood that the method involves creating a model describing the distribution of electromagnetic fields in different regions of animal body radiation at different frequencies, different power flux density and exposure time. However, the solution of this problem involves the overcoming major difficulties of theoretical and methodological nature. Based on the logical sequence of presentation and including electro-physical properties, in particular the permittivity of biological objects, we used the classical approach to calculate the structure of the electromagnetic field inside the uterus of cows when exposed to external electromagnetic fields. The main purpose of the theoretical calculations of the electromagnetic field microwaves inside the uterus of cows is to study their distribution in the volume of the object in order to treat endometritis by changing biotropic parameters.

Using these calculated ratios a forecasting can be made that shows the impact of electromagnetic fields on certain areas of biological objects with different percentages of water.

Keywords: electromagnetic field, endometritis of animals, model of the animals' internal organs, electromagnetic therapy.

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CORRECTING PREDICTION PROCEDURES WHEN CONTROLLING POLLUTANT EMISSIONS OF ENERGY ENTERPRISES

page 42–44

The problem of obtaining information redundancy contained in random, generally nonstationary by the mathematical expectation dynamic processes under control was considered in the paper. A mathematical model of predicting critical emissions in random atmosphere pollution processes with the correction to asymmetry of the processes was proposed. The procedure of testing a multicomponent pollution process by parameters during a multivariable control considering its extrapolated values was described. An algorithm of a parametric significance test concerning stationarity violations with regard to risks of the first type control was developed. The test implements a procedure of verifying statistical hypotheses. This approach allows using the extrapolation model, adjusted towards the mathematical expectation, reducing risks of the second-type control.

The research results, described in this paper can be used by specialists in the field of ecological control and monitoring, as well as in information systems and technologies.

Keywords: ecology, control, multicomponent pollution, model, correction, extrapolation, process asymmetry, quality.

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ESTABLISHING THE CONNECTION BETWEEN ROAD-TRAFFIC OPERATING CONDITIONS OF MOTOR VEHICLES OF INTERNAL FORCES AND TRAFFIC SAFETY IN SETTLEMENTS

The ways of improving the system for evaluating operating conditions of special-purpose wheeled vehicles of internal forces when executing service-combat missions are outlined.

The efficiency of using special-purpose wheeled vehicles, which is connected with the need to predict operating indicators that directly depend on the operating conditions, is evaluated in the paper. However, today there is no scientifically sound methodological apparatus that would allow to take into account operating conditions, specific to executing service-combat missions by internal forces, when planning the use of special-purpose wheeled vehicles.

The most appropriate way is the analytical modeling of the movement of special-purpose wheeled vehicles on a street-road network with considering the main operating parameters.

Implementing the obtained results will allow to develop simple and at the same time effective methods for calculating operating costs, service life, and provide an opportunity to improve the efficiency of organizing the operation of vehicles through developing rational rules and regulations for the transport operation.

Keywords: traffic control, traffic safety in settlements, special-purpose wheeled vehicles.

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ENSURING A COORDINATED CARGO TRANSSHIPMENT PROCESS MANAGEMENT IN GENERAL TRANSPORT HUBS

Developing the proposed approach to the transport hub management is initiated by the fact that during the second half of the last century proponents of classical management theory focused on building economic-mathematical models of cargo transshipment management in terms of well-developed mathematical disciplines. In the beginning of this century, scientists have shifted to approaches to the transport hub management organization, proposed by Western European scientists, based on modern theories of business conduct.

In this paper, an original approach to ensuring the coordinated transport hub management, based on combining the methodology of classical science of optimal management and constructive ideas, new progressive concepts of business conduct in conjunction with the social management theory was proposed.

It was found that the proposed approach should be realized in two stages: first it is necessary to coordinate cargo transshipment process parameters, and then ensure optimal implementation of this process.

The provisions set forth in the paper have theoretical significance since they are characterized by scientific novelty and are useful in practical terms as they improve operation efficiency both of transport hubs, and their customers.

Keywords: transport hub, cargo transshipment, optimal management, partnership, transshipment optimization.

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CALCULATION OF TWO-FREQUENCY INDUCTION SYSTEMS — TOOLS FOR EXTERNAL MAGNETIC-PULSE STRAIGHTENING OF AUTOMOBILE BODIES

The paper considers the issue related to the improvement of the existing methods of calculating a tool for external magnetic-pulse straightening of auto body parts. The purpose of the research is to calculate the field density ratio, excited in two-frequency induction systems, i.e. tools for external magnetic-pulse straightening of dents in auto body metal coatings.

The calculated ratios for the field density, excited in two-frequency induction systems, i.e. the tools for external magnetic-pulse

straightening of dents in auto body metal coatings are obtained in the paper. This allows solving the problems related to the space-time distribution of the resulting magnetic field strength in sheet metal dents, i.e. improving induction system efficiency that is the main direction in designing special devices.

The research results can be used by scientists and teachers, postgraduate students, students of educational institutions and experts in transport enterprises for improving production efficiency.

Keywords: magnetic-pulse metal treatment, induction system, straightening tool, magnetic-pulse straightening, auto bodies.

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RESEARCHES OF EMISSION SPECTRA OF LIQUID-PHASE OBJECTS DURING GAS DISCHARGE VISUALIZATION

page 58–62

Ukraine faces the issue of express control of impurities in water or in liquid — phase object, in particular — the mineralization in the systems for central fresh water supply. The existing methods for the analysis of liquid phase objects are based on chemical analysis, photo and colorimetry, gravimetry, spectroscopy, conductometry. Methods, based on measuring the electric resistance are usually used for the determination of the general mineralization. This, however, does not allow to determine the small concentration values of general mineralization with sufficient accuracy. Therefore, there had been suggested the method for the determination of the small concentration of the general liquid phase object mineralization by emissions spectrum registration during gas discharge visualization which allows to improve the accuracy in determination of the general mineralization with short-term measurements and cheap equipment.

In accordance with the suggested method there had been developed the experimental unit, on which there had been conducted the series of experiments with water-soluble salts NaCl, $MgSO_4$, KCl, $CaCl_2$, $FeSO_4$; there had been received their emissions spectrums. There had been determined that for $Na1^+$, $Cl1^-$, Mg^{2+}, Fe^{3+}, Ca^{2+} ions there is observed the higher spectral lines for wavelengths that are close to wavelengths of spectrum lines of those elements. There had been proved the possibility for the determination of availability of several salts in one liquid phase object.

The obtained results prove the possibility of using the suggested method for the determination of the general mineralization. It enables to create in future the automated system for controlling over the minaralisation for the system of fresh water supply.

Keywords: gas discharge visualization, liquid phase object, emissions spectrum, line spectrum, characteristic spectral lines.

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THEORETICAL ANALYSIS OF VIDEO PULSES DISTRIBUTION IN BOVINE MAMMARY

page 62–66

The preservation of newborn calves particularly in the first days of life is being influenced by the amount of immunoglobulins in colostrum and milk of cows. Immunoglobulins perform a leading role in humoral immunity, their level reflects the functional activity of B-lymphocytes.

Recently in human and veterinary medicine electromagnetic methods are gaining attention which allow to improve immunoglobulins in colostrum and milk cows. Thus in the article the theoretical analysis was made of the interaction of electric field pulses with a mammary gland calved cows. The obtained results allow us to investigate the distribution of pulsed electric field in the mammary gland and determine the parameters of pulsed radiation (pulse amplitude, frequency and pulse repetition period; exposure value) to increase immunoglobulins LgG and LgM. Increase in immunoglobulins in colostrum and milk allows to boost immunity in order to preserve the newborn calves and reduce the cost of their treatment.

Keywords: bovine mammary, pulses of electric field, colostrum of the cows, immunoglobulins.

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USE OF INTROSPECTIVE INTERFACES IN APPLICATION LAYER PROTOCOLS

Technologies and architectures of applied software systems have significant achievements in the field of creating monolithic and new solutions, which are expressed in well designed and thought out software development methodologies, programming paradigms, platforms and libraries, but the task of integrating disparate information systems (IS) is still poorly elaborated. Movement towards uniform and centralized solutions cannot fully eliminate the integration problem until all the software in the world will become an integral software package with a common architecture, cross-cutting standards and continuous synchronous update process. Under the conditions of heterogeneous distributed IS, the relevance of integration tasks increases. Summarizing the theoretical and practical experience of binding application web-service type IS, the authors propose an approach to solving the problem of dynamic binding of application programming interfaces (API) in distributed information systems, using the methods of metaprogramming and its various techniques, such as introspection, dynamic modification of the structure and functions of the software modules, use of metadata and dynamic interpretation of metamodels. At interaction of two or more systems through network interfaces with introspection and interpretation of the metamodel, there is dynamical binding of their interfaces, allowing to modify the functionality of applied information systems without specialized adaptation of calls and change in the code, and also to bind the systems, interaction of which was not originally intended. This method increases the IS flexibility and allows significantly improve the code reuse and IS development and operating efficiency in general.

Keywords: service architecture, metaprogramming, introspection, dynamic interpretation, metamodel, metadata, binding, interfaces.

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DETERMINATION OF PARAMETERS OF ELECTRIC MAGNETIC FIELD FOR PRESOWING TREATMENT OF SEEDS OF SUNFLOWER

Economic analysis shows, that now in Ukraine the average yield of agricultural crops has decreased by 20–25 %, including sunflower, due to the high cost and lack of mineral fertilizers and means of plant protection from pests. Therefore, the urgent task is the development of new cost-effective, efficient and environmentally safe technologies, aimed at improving the yield and quality of the seeds sunflower. One way of solving this problem is the use of information EMF EHF.

In the work, on the basis of the developed model of sunflower seeds and theoretical research is by definition biotropic parameters bottom-kinergetics (information) electromagnetic fields millimet-metre wavelength range (frequency, the power flux-density, Expo-sure, amplitude modulation), which may have an impact on the biophysical processes in seeds. The use of the electromagnetic field, with established biotropic parameters for pre-sowing treatment of seeds, let yield and oiliness seeds of the new harvest.

Keywords: sunflower seeds, frequency electromagnetic fields, the modulation parameters, power of EMF, pre-sowing treatment of seeds.

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