SYSTEMS AND CONTROL PROCESSES

RESEARCH OF APPLICATION POSSIBILITY OF MAGNETOMETRIC METHOD FOR CONTROL OF MECHANICAL STRESSES OF SHIP HULL

page 4–9

The possibility of using magnetometric method to control the mechanical stresses of the hull is investigated in the article. The magnetic stray field of the hull as the ferromagnetic object control, created a uniform field of the Earth, is calculated for this purpose. The hull is represented as the totality of the surface field sources. It is compiled the Fredholm equation of the 2nd kind, which was reduced to a system of linear algebraic equations by approximating the surface of the object control set of elementary areas of rectangular shape. The average value of the normal component of the magnetization on each side of the platform has enabled to determine the magnetic field outside of the hull. Results of the study of the magnetic stray field of the hull showed that the magnetic field strength measuring range is sufficient to measure the modern magnetic modulation converters — ferroprobes. It is shown that this method is an effective method to control the mechanical stresses of the hull, which prevents exceeding the permissible stresses in the supporting structures of the ship, which could lead to the destruction of the hull.

Keywords: hull, ferromagnetic object of the control, mechanical stress, magnetic stray field.

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MAIN DIRECTIONS IN DEVELOPMENT OF ORGANIC INDUSTRY IN UKRAINE AND EXPERIENCE OF INNOVATION IMPLEMENTATION: A COMPREHENSIVE ANALYSIS

page 10–14

Active development of organic agriculture sector is one of strategic priorities for Ukraine. That is why the study of effective ways and directions of development of organic farming is currently a relevant scientific task. In our study we present the results of the analysis of main driving forces and existing barriers for development of organic sector of agriculture in Ukraine. Based on obtained results, we are able to conclude that:

— rich natural resource potential of Ukraine and a long tradition of natural farming provide the necessary preconditions for the effective development of organic production;

— the main obstacle for development of the industry is the lack of financial commitment from the government;

— the active forms of support for organic production currently include attracting of foreign and donor investments, as well as participation in international scientific and practical projects.

We also present a comprehensive systematization of perspective directions for development of organic production in the form of structural and logic scheme. The main emphasis is on systemic, institutional, informational and organizational elements. In addition, the particular importance of regional and global markets, as well as the control of environmental safety is indicated.

Most of these measures require complex research and development of the appropriate strategies and algorithms for their implementation. Therefore, our research is focused on the development of effective measures of regional support for organic farming. To a large extent the efforts are focused on Poltava region, which has considerable natural potential, long-established traditions of organic farming, as well as an attractive investment climate for foreign and domestic innovations.

Keywords: organic production, natural-oriented agriculture, investment projects, agricultural technologies, agribusiness.

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DEVELOPMENT OF METHODS FOR DYNAMIC DISTRIBUTION OF PARAMETERS TO PRODUCE PRODUCTS IN LIGHT INDUSTRY

page 15–18

Universal distribution function of anthropometric characteristics, that taking into account the real according to different consumer groups is constructed. This function is used for program planning output of light industry, which is complicated by a wide variety of types and sizes of products, which in turn is caused by a variety of anthropometric consumers of these products.

The resulting distribution function allows to find integrated parameters, which allow to predict the total number of products. Application of non-uniform distribution function allows us to calculate the percentage of different sizes based on the most complete software market. Rational production capacity at the same time can be determined based on the integrated dependency falling into a given size range. percentages for different groups are recommended on the base of the size of the existing classification of light industry products. The results allow to determine the percentages of sizes and plan accordingly output in accordance with the real needs of consumers.

Keywords: anthropometric standards, unequal distribution, release program, the variable distribution of fashion.

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IMPROVING THE QUALITY CONTROL SYSTEM OF PRODUCTION PROCESS

page 18–21

The article is devoted to problems of analysis of the production process of leather manufacturing at the enterprise of automotive industry. The results of experimental studies during the technological processing of leather manufacturing are given. The main tool of statistical process control is control cards by which monitored the distribution of measurable characteristics of the production process, and whether they are within the control. The area on the graph shows the total change in both the manufacturing process and the measurement process.

During the research the basis is the use of index reproducibility and process suitability of the quality control system that are effective tools for continuous improvement of quality, performance and management decisions. Statistical control method is used to assess the suitability of the production equipment (C_P) and dispersion parameters (C_{Pk}) of the production process to explore availability or unavailability of the process.

Keywords: production process, quality control, capability investigation.

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DEVELOPMENT AND RESEARCH OF INTELLIGENT SYSTEM FOR ANALYSIS OF RANDOM CHARACTERISTICS OF STOCHASTIC PROCESSES OF MECHANICAL QUANTITIES

page 22–26

At the present stage of development of measurement systems it is particularly acutely the need of total computerization of the measurements. This understanding was the impetus for the functionality development of measuring devices and the development of intelligent measuring systems (IMS) of new generation. Therefore, one of the most important areas of measuring systems is their intellectualization that enables to determine their purposeful behavior (algorithm operation) depending on changes in their conditions of work and required accuracy of measurements.

Within this article the research and development of IMS required accuracy for analysis of stochastic characteristics of random processes of mechanical quantities and publishing guidelines for their implementation.

As a methodological basis of solving this problem it is used a comprehensive approach to determining IMS errors.

The article shows the understanding that IMS let select the best algorithm for measuring the stochastic characteristics of the measurement results and accompanying assessment of their errors.

This event is realized by using an integrated approach to the definition of statistical errors of measurements of mechanical variables. Theoretical analysis and experimental verification of these results showed that a comprehensive approach to the definition of statistical error of measurement allows, first of all, get a scientifically based assessment of the accuracy and reliability of measurement results.

The article shows that the synthesized algorithms allow for the same length of implementation to reduce measurement error in 2–4 times in comparison with known algorithms. Conversely, at constant measurement accuracy by the same factor can reduce the length of implementation.

Keywords: intelligent system, measurement, mechanical quantities, stochastic process, database, intellectualization.

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STRUCTURE DEVELOPMENT OF DIAGNOSTIC PROVIDING AND DIAGNOSTIC MODEL OF AXLE BOXES IN MODERN RAILROAD CARS

page 26–29

The study of technical and informational characteristics of embedded control systems of axle boxes has allowed creating the overall structure of the diagnostic software for axle boxes for modern railroad cars and also apply a thermal model and the recognition of the technical condition of axle boxes for solving the problem of increasing the reliability of the control of the rolling stock when it moves, due to the recent increase in the speed of movement of the extended portion of non-stop movement, as well as an increase in the intensity of the operation of rolling stock.

Based on these studies it was developed the overall structure of the diagnostic software for axle boxes of modern railroad cars. It offers the most informative diagnostic features of the technical condition of axle box, increasing the accuracy of control and reduces the impact of various types of interference in its results. It is built diagnostic model of axle box on the basis of the thermal model based on additional parameters, the measurement of which is technically feasible only embedded systems.

The proposed structure of the diagnostic software for axle boxes will not only improve the reliability and efficiency of control, but also makes it possible to detect emerging defects in the early stages and to solve the actual problem of forecasting residual resource of axle box to reduce the number of uncoupling of defective railroad cars.

Developed activities will help to improve traffic safety and stability of the transportation process.

Keywords: axle box, control of technical condition, diagnostic model, built-in test equipment, diagnostic features.

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FORMATION OF TRAFFIC CURVE OF LIFTING MECHANISMS TAKING INTO ACCOUNT ELASTIC PROPERTIES OF TRANSMISSIONS

page 30–33

Elastic mechanical vibrations adversely affect the control quality, increase the dynamic loads on the lifting mechanisms, contribute to the accumulation of fatigue stresses in the kinematic chains that cause need for their detailed consideration. In the article it is done the synthesis of mathematical relationships that are at any given parameters of lifting mechanisms allows taking into account the elastic properties of the cable transmission, calculate the actual diagram of the lift car, determine the maximum values of velocity, acceleration and jerk that allows to estimate the parameters of passenger elevators, as in the famous classical optimal control law, and in a completely arbitrary control laws. The difference between the maximum accelerations and jerky of passenger lift cabin and their calculated values is determined. The actual maximum acceleration of the passenger lift cabin on 20,0–40,0 % higher than the values determined without taking into account the elastic ties. The increase of the jerk is even more significant and can reach 60,0–140,0 %. The synthesized mathematical relations can be used in case of diagram forming of the lift car moving based on external constraints, such as heat, or if necessary, implementing the «degenerate» triangular diagrams. Based on the analytical expressions can be developed: nonlinear mathematical and physical models, which make it possible, in real time, in a wide range of source data, perform analysis of modes of lift drivers of various types; technical advice on damping lifting mechanisms of arbitrary passenger lifts.

Keywords: movement diagram, lift car, lifting mechanism, control law, elastic properties.

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PREDICTION OF THE VESSEL SPEED WITH THE INFLUENCE OF EXTERNAL FACTORS AND DIMENSIONS OF THE HULL FOR THE SAFETY SYSTEM FROM POTENTIALLY DANGEROUS VESSELS

page 34–38

It is given the possibility of a monitoring system for the identification of navigation and positioning of vessels. Practical importance is the use of information on navigation conditions and weather conditions to work out options for possible scenarios in a storm, especially when entering the ports and in the ports. To ensure the health security system from potentially dangerous ships should be able to predict the speed of the vessel, taking into account the impact of external factors and dimensions of the body. The fact that even within the same series of court differs in their dimensions has a practical interest in the task of translation speed of the vessel for its specific dimensions.

The relations between the parameters of the model body, speed, and full-scale dimensions of the vessel are given. This relation can

be used to identify the main dimensions of the vessel and to assess the speed of the ship at early conceptual stages of project of the vessels.

Keywords: boundary layer, speed of the vessel, dimensions of the vessel, safety from potentially dangerous vessels.

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USE OF THE FRAME STRUCTURES IN THE SYSTEMS OF COORDINATION AND CONTROL OF COMPLEX OF BATCH VACUUM PANS

page 38–42

The definition of new requirements for the control of technological complexes of sugar raises the problem of development and implementation of innovative control systems.

Solving these problems is fully possible only when using intelligent control systems. A promising direction is the development and implementation of case control systems.

The work was developed a two-level frame structure for coordination and control of the technological complex of batch vacuum pans. The resulting two-level frame structure is defined in the format of categories: Action — A, situations — S, parameters — D. This structure allows constructing multi-level hierarchical control systems, and allows to quickly changing the control system with the help of script tools.

Application of the proposed structure of frame type of case control systems (agent-based systems) allow more efficient, on a qualitative level, to lead the process of mass crystallization of sugar, integrated technological systems in multilevel hierarchical control systems.

A promising area of application of multi-level frame systems is the use of their knowledge bases and decision-making systems of administrative and technical control systems.

Keywords: technological complex, vacuum pan, frame system, intelligent agent.

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POSSIBILITY EVALUATION OF THE USE OF SHREDDED VULCANIZATE MODIFIED BY NITROGEN-CONTAINING COMPOUNDS

page 42–47

During research with the help of mathematical modeling methods have been developed elastomer compositions with optimum composition based on rubbers of general purpose containing shredded vulcanizate modified by nitrogen-containing compounds. Today, the trend of development of polymer materials science is to find efficient ways of using materials known by modifying their properties. The priority in the development of a modern economy is the solution of environmental problems; first of all assess the possibility of re-use of waste as a production of rubber products and bump rubber. As a result, it is identified a synergistic effect of influence of conforming modification on the level of rubber strength, parameters of influence of the physical and mechanical factors on the efficiency of the modification are obtained. It is defined an influence of the equipment type for the manufacture of rubber compounds with shredded vulcanizate. It is developed and tested a mathematical model of the modification process automation of shredded vulcanizate, received the practical confirmation of their performance. The urgency of research in this area is the ability to automate the process of modifying shredded vulcanizate and forecasting results of the use of secondary raw materials for high-quality performance of the final product. This allows to virtually avoiding long and resource-intensive process of experimentation and empirical tests. That, in turn, will reduce the cost of time, human and material resources in order to optimize the manufacturing process.

Keywords: measurement accuracy, shredded vulcanizate, modification, composite, nitrogen-containing compounds, diffusion, optimization.

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FORECASTING OF TRAFFIC FLOW PARAMETERS IN THE PLANNING OF HIGHWAYS

page 47–51

Existing methods of forecasting the traffic flow are analyzed. Five types of forecast by period for which it is executed and three groups of models for forecasting approach to traffic flow are marked. It is found that for solving road safety audit at the planning stage of roads are useful methods of long-term forecast. It is proposed to use a balance method, which is based on the use of the incoming data of the traffic composition. Groups of the vehicles as part of the traffic flow are marked, which should be considered when planning and designing roads. To predict the composition of perspective traffic flow it is proposed the method based on Bayesian forecasting. The proposed approach can be applied to the road safety audit at the planning stage of roads.

Keywords: road safety audit, traffic flow composition, forecasting, traffic flow intensity.

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COMPLEX APPROACH TO THE ISSUE OF INTEGRATION OF PUBLIC TRANSPORT AND URBAN PLANNING

page 51–54

When planning new districts of major cities in Ukraine, it should take into account the experience of leading countries. Today in many cities of Ukraine, there are traffic jams, especially during peak hours, due to including public transport, standing on street stops, thus preventing free passage of passenger cars. It is necessary to carry out a new assessment of passenger traffic in order to discharge the main transport highways. The best option is to expand the network of subway lines and new stations will replace ground public transportation by underground, which not only ease traffic flow, but also improve the ecological situation in big cities of Ukraine.

It is advisable to use a system approach using the multi-criteria optimization method that presented in the article when creating a ground infrastructure of cities. It is also expedient a method for calculating the required number of traffic lights depending on the number of intersections proposed by the authors.

The proposed approach to the integration of public transport and urban planning provides many advantages. Territorial development management reduces the need to move, high quality public transport can easily meet the needs of the crossings. Leading role in promoting this policy plays public transport administration. Districts with realization of such integrated projects become more affordable that leads the other socio-economic benefits.

Keywords: transport system, public transport, integration.

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INFORMATION AND CONTROL SYSTEMS

IMPROVEMENT CONNECTION CONTROL OF OPTICAL COMPONENTS USING TV MEANS

page 55–59

The possibility of using the TV means for control of the nodes and optical components, in particular, the presence of defects in their joints.

The necessity to control the optical components during the manufacturing process throughout the process flow as it provides a saving of material and financial resources is proved.

It is proved that TV is a preferred method and means to interference and shadow method in the control of optical components and their joints.

An overview of joining technology of optical components is done and their requirements on permissible size and number of defects per unit area of the connection are classified.

It is theoretically proved the possibility of measurement of geometrical sizes of defects with an accuracy which exceeds the minimum element resulting in a television camera image — one pixel. Subpixel measurements are provided by algorithmic methods with computer imaging.

The properties of the error sources of television measurement and the criteria for neglecting some of them are analyzed. In particular, the possibility of compensating unevenness sensitivity of television camera is marked.

The study shows the need and opportunity to use a wide television methods and means for controlling optical defects in the components, as well as compounds that lead to substantial savings in the production process, and the operation of optical devices and systems.

Keywords: optical components, TV control, sub-pixel measurement, photovoltaic solar panels.

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