SYSTEMS AND CONTROL PROCESSES

STUDY OF THE PARTICLES DEFORMATION OF NICKEL COATINGS OBTAINED BY THE COLD GAS-DYNAMIC LOW PRESSURE SPRAYING TECHNOLOGY

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Deformation of the nickel particles during collision of the base surface with cold gas-dynamic spraying at different operating temperatures is studied in the article. The aim of this work is to determine the dynamic yield stress, temperature and plastic work of the particles in the cold spray. Nickel powder coatings on cold spraying device DYMET 405 were covered and the coating microstructure for measuring equivalent strain of the particles for each sample was analyzed to accomplish this aim. It is shown mathematical model to determine deformation parameters, for which one of the data source is founded equivalent deformation of the particles. This article presents the dynamic yield stress of the deformed particles, the calculated temperature in the contact area and the energy balance, with particular attention to the plastic particles. The calculations do not take into account the size of the particles and the deformation of the particles is considered equivalent to the entire coating. The presented method can be applied to studies of any coatings obtained by cold spraying. It can also be used to understand the influence of the parameters on the deposition of the coatings. In this paper it was established a high probability of melting of the particles and the effect of tamping by the ceramic particles of the metal particles to form a coating.

Keywords: cold spraying, deformation, dynamic yield strength, coatings, analysis of the microstructure.

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CREATING ORGANIZATIONAL AND TECHNOLOGICAL AUTOMATIZED CONTROL SYSTEM OF WATER SUPPLY OF A LARGE CITY

page 9-13

One of the main problems in the municipal economy is the problem of improving the quality and efficiency of water supply systems. In the very large water systems hidden reserves, the use of which allows to achieve significant savings of unproductive material and energy costs, and improve the provision of the population and industry with water.

In this article the structure of the system of water supply control in a big city is presented. These studies are aimed to

the full, timely and uninterrupted supply of all consumers of water supply systems of cities in the desired quantity of water specified quality. The structure scheme of a city water supply system which represents the interconnection between subsystems and their functions is worked out. The main problems of automatized system of technological processes control of water supply system while designing are discussed.

The analysis of the work of automated process control systems for urban water supply, draws attention to the main difficulties and problems in their construction. Working in a number of cities in the country and the UIC automated process control system for water supply are purely informational. You must be connected to the system of collecting information for a larger number of measured pressure points of the network, and operating an automated process control system of water supply and putting on optimal control.

The implementation of organizational and technological automated control system of water supply of large cities, in practice, can significantly improve the quality and efficiency of the water supply, make better use of their internal resources by reducing wastage of water, reducing energy costs, reducing the number of accidents on the network.

Keywords: object of control, water supply system, functioning, model, criterion, quality, efficiency, automatized control.

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DETERMINATION OF TECHNOLOGICAL RISK DURING MAINTENANCE WORK ON OIL TANKS

The article is devoted to the improvement of environmental safety at hazardous objects and surrounding areas with the presence of technological processes related to repair of oil tanks by controlling technological risks defined taking into account the influence of factors on their values.

The aims of the study were man-made risks and extent of environment pollution as a result of accidents caused by process or the operation of the repair of oil tanks.

In theoretical studies it was used complex of the methods: analytical – in the generalization of scientific advances on environmental safety and to identify ways to improve its effectiveness on dangerous objects and the surrounding areas with the process operation or repair of oil tanks; method of similarity theory and dimensional analysis – the study of hydro-mechanical cleaning tanks, as well as for determining the work of adhesion at the interface solid – liquid, and the study of layer formation of oil residues on the surfaces of the tank. In mathematical modeling of the formation of oil layer on the surface of the tank it was used the regression analysis of single and multi-factorial experimental curves. Experimental studies based on modern approaches of experimental design and methods of the theory of mathematical statistics.

It was conducted mathematical modeling of harmful deposits formation on the internal surfaces of the walls of the tank, taking into account technological, physical and chemical properties of oil and gas-air temperature in it. It is experimentally verified and confirmed the adequacy of the proposed model.

Calculation of the possible volumes of formation of environmentally hazardous products of cleaning storage tanks for oil and oil products to the content of harmful substances from manufacturing operations related to repair were conducted in view of the results of theoretical and experimental research.

Keywords: technological risks, environmental contamination, oil tank, probit-function, residue oil.

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IDENTIFICATION OF UNCERTAINTY SOURCES STATISTICAL DECISIONS WHEN DIAGNOSING INDUSTRIAL FACILITIES

page 18-22

We consider probabilistic models of decision-making as part of the generalized algorithm of technical diagnostics. The existence of three sources of statistical uncertainty of decisions that affect the accuracy of diagnosis and restrictions on the number of measurement information. Developed and presented probabilistic graphical model types diagnostic reliability of dynamic objects.

These studies continued to study one of the directions in the matter of building control systems and diagnostics based on a probabilistic or statistical approach.

Such an approach is justified, since all parameters in the industrial objects are random and deterministic view does not allow the construction of efficient algorithms for control, diagnostics and management. Studies that are given in the article was a logical continuation of the work of the author in the field of vibration diagnostics of the state of industrial facilities.

Keywords: diagnostics, reliability, probability, uncertainty, unsteadiness, decision function, discriminant analysis.

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DETECTION OF EMERGENCY SITUATIONS DURING THE WORK OF BATCH VACUUM APPARATUS

page 22-27

Modern requirements for control of sugar technological complexes make the task of development and implementation of innovative control systems.

Solution of new challenges is fully possible only when using intelligent control systems. The promising way is the development and implementation of control systems based on the principles of situational control. Use of such systems allows creating intelligent multi-agent system, based on a knowledge base of agent environment.

It was designed and built two-level frame structure of detection of conflict situations for the batch vacuum apparatus control. The resulting two-level frame control structure defines emergency and conflict situations in the format of environment categories: actions – A, situations – S. Such structure of frame building allows create multi-level control systems and enables rapid change control system through the mechanism of scenarios.

Algorithms of frame of conflict situations created with the help of language of situational control and situational description of the object.

Application of the proposed frame structure in the case control systems (agent systems) allow more efficient, at a qualitative level, to monitor the mass crystallization of sugar, integrate equipment in the technological complexes, as well as in the multi-level system of production control.

A promising area of application of multi-level systems is their use in decision-making systems, organizational and technical systems.

Keywords: technological complex, vacuum apparatus, frame system, intelligent agent, frame of the conflict situation.

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INVESTIGATION OF INTEGRATED QUALITY INDEX OF DESSERTS AND FUNCTIONAL BEVERAGES

Implementation of the strategic directions of the development of food functional production in Ukraine is aimed at growth in production of healthy food. Among dietary factors relevant to maintaining health, working capacity and active longevity a decisive role belongs to the regular supply of the body's functional complex of macro- and micronutrients contained in dietary supplements and physiologically active materials. Permanent deficit of such nutrients leads to the fact that the physical condition and overall health unstable, and this, in turn, contributes to the gradual development of chronic diseases, disorders of alimentary functions, including immune and specific resistance.

The authors conducted a study that found that the adding of desserts and functional beverages, herbal dietary supplements and physiologically active materials in the food composition significantly improves organoleptic, physical and chemical and microbiological parameters of developed products. Calculations of integrated quality index for desserts and functional beverages and analogous product allow determining the overall impact of dietary supplements of plant origin and physiologically active materials on the quality formation in terms of figures. The possibility of directed regulation of competitiveness of products by determining the integrated quality index was determined.

Keywords: physiologically active materials, herbal dietary supplements, desserts, beverages, functional purpose.

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DETERMINATION OF TRANSFER FUNCTIONS OF THE AUTOMATIC ELECTROHYDRAULIC DRIVE FOR SPECIAL PROCESS EQUIPMENT

This article discusses the improvement of special technological equipment due to the development of mathematical models of work processes that occur in the equipment and take into account the particular purpose of the process equipment. The main objective is to construct a mathematical model and obtaining the transfer functions of the electro-hydraulic drive equipment with passport data of standard devices and drive devices. The linearization of the mathematical model is made on the basis of the analysis of dynamic and statistical characteristics of work processes in equipment subject to a number of assumptions. The developed mathematical model and transfer function of the system allows you to perform a stability analysis, assessment of the quality of regulation and correction of dynamic characteristics based on passport data elements of the drive. The research results can be used by engineers involved in the development of automatic control systems of special technological equipment. A mathematical model is proposed in the work enables the development of automatic control system, which will expand the functionality and efficiency of special technological equipment.

Keywords: transfer functions, dynamic performance, a mathematical model, automatic electrohydraulic drive.

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CROSS-BORDER COOPERATION: MODELING OF PROJECT DECISIONS AT RECONSTRUCTION OF MUNICIPAL HEATING SYSTEMS

page 40-44

The integration processes, associated with the desire of Ukraine to the European Union, require the reduction of technical and technological level of the different economic sectors in accordance with regulatory measures accepted in the Union. This problem is important for municipal heating systems.

Among the most common problems related to the heating systems of municipalities of Ukraine, which is largely determined by the relevance of the formation and implementation of projects and programs of reconstruction, there are following: technical and technological, environmental and socio-economic.

Reconstruction and modernization of municipal heating systems is based on models and mechanisms of the theory of project management. The models of the theory of project management related to projects of reconstruction of municipal power systems are considered. It is shown that in the framework of project management on the problems of reconstruction of municipal heating systems is not scientifically based and comprehensive solution.

The model of management of reconstruction projects for municipal heating systems is developed on the basis of the use of established knowledge base and database serving as an artefactual design solutions obtained by each of the parties on their own cross-border cooperation.

Keywords: project management, heating system, model.

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COMPUTATIONAL STUDIES OF BUILDINGS' THERMAL STATE

page 45-48

This article deals with applying numerical methods of thermal condition modeling of buildings and their component parts in heat-and-power engineering. Some research results in this area are also presented. The main purpose of the study is to improve energy efficiency of buildings' thermal power on the basis of thermal conditions analysis. The object of the study is the thermodynamic parameters of the thermal state of the buildings heated by radiators of radiative-convective type. This article presents methods of modeling of aerodynamic and heat transfer processes in the buildings with the help of software package ANSYS CFX. The research results can be applied by energy auditors in the field of heat-and-power engineering to assess compliance of the comfortable conditions inside the building, to analyze its thermal state, to assess the effectiveness of various energy-saving measures.

Keywords: heat supply, modeling, buildings' thermal state.

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