
Abstracts and Keywords

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The Development of AIS of Quality Control of a Manufacturing Enterprise

Keywords: quality; information processing automated system; design; enhancement.

Abstract. The paper presents the development of an automated information system for quality control of a woodworking enterprise. The paper covers key aspects such as selection and integration of sensors and transducers, data collection and analysis, creation of monitoring and control system. Special attention is paid to the possibilities and advantages of using artificial intelligence (AI) for automatic diagnosis and classification of defects, which helps to reduce scrap and improve production efficiency.

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The Development of a Dynamic Model of a Three-Circuit Pumped Storage Hydropower

Keywords: modeling; EESS; PSH; ternary PSH; hydraulic short circuit.

Abstract. The purpose of this work is to present a dynamic structural model of a pumped storage hydropower (PSH) with ternary units. A hypothesis has been put forward about the effectiveness of using this type of PSH as a “system” of energy storage devices. The current situation of energy storage systems in Russia is reviewed, the technology of a ternary PSH is described and the results of the model development are presented. Methods of mathematical modeling and structural analysis are applied. As a result, a block diagram describing the dynamics of the ternary unit is obtained.

A.A. Медведев, А.И. Посеренин

Применение сурьмяно-бериллиевых источников нейтронов для решения задач трековой радиографии

Ключевые слова: бериллий; бор; литий; предел определения; сурьмяно-бериллиевый источник; трековая радиография.

Аннотация. Целью исследований является определение локальных концентраций и пространственного распределения бора, лития и бериллия в образцах горных пород. Исследования проводились с применением источника гамма квантов ^{124}Sb активностью 500–1 000 Кюри и $^{124}\text{Sb-Be}$ источника нейтронов с выходом 10^8 – 10^{10} н/с методом трековой радиографии.

Рассмотрено одно из направлений радиографии, основанное на регистрации специальным твердым детектором альфа частиц, образовавшихся в результате различных ядерных реакций, с последующим выявлением соответствующих следов (треков) в регистрирующей среде детектора. В результате исследований получены пределы определения бора и лития $n * 10^{-5} \%$ и $n * 10^{-4} \%$, а бериллия $n * 10^{-1} \%$, что удовлетворяет целям изучения пространственного распределения указанных элементов в рудах и минералах.

D.V. Tikhonenko, V.A. Ushakov, P.S. Suprun

Designing of information system of processing enterprise

Keywords: information system design; automated system; modernization; information processing.

Abstract. This article is devoted to the issues of designing an information system for a processing enterprise engaged in woodworking activities. The purpose of the work is to design an automated

quality control system, which will reduce the time of information processing and increase the speed of management decision-making. The need to develop such an automated quality control system was that the methods and means of storing and processing information used in the work of the organization were not automated and required large time and labor costs when working with data, and this can lead to errors, delays and other negative consequences.

E.V. Filyushina, V.A. Vasileva, V.V. Boldyrev, D.V. Tikhonenko

IT Project Management Tools and Techniques for Successful Project Implementation

Keywords: IT projects; analytics; software; project management; enterprise operations.

Abstract. The purpose of this paper is to analyze IT project management tools that will help to implement IT projects correctly and successfully. The methods of project management are considered, as well as the factors on which the choice of method depends. The most popular IT project management schemes that can be used depending on the type of project are also considered. The article is devoted to the problem of choosing a combination of methods and schemes, as successful IT project management allows reducing the time and costs of information technology implementation and improving the quality of enterprise performance.

A.A. Chepiga, S.V. Petrenko

A Mathematical Model and Algorithm for Controlling the Rotary Device of a Service Complex for a Set of Spatially Distributed Groups of Air Objects to Implement Its Trajectory in Minimal Time

Keywords: spatially distributed groups; detection and tracking complex; rotary device; the law of displacement.

Abstract. One of the ways to increase the efficiency of the functioning of ground-based service complexes for spatially distributed groups of air objects (SDGAO) is the creation and improvement of automatic and semi-automatic control systems that ensure the maximum realization of the capabilities of the detection and tracking complex. The purpose of this article is to develop a mathematical model and an algorithm for controlling the rotary device of a service complex to realize its trajectory of movement when accompanied by a set of SDGAO in a minimum time. The synthesized algorithm and models, the correctness of which was tested in SimInTech, allowed us to obtain a relative gain in time when the universal law of movement of the rotary device of the detection and tracking complex was optimal at the most common movement interval of 1° – 5° 35 %, and at the interval of 10° – 17° 40 %

M.G. Shayakhmetov, R.G. Vildanov

A Digital Twin for a Training Laboratory Installation to Study Methods and Means of Control and Pressure Regulation

Keywords: pressure measurement; digital twin; virtual model; laboratory simulator; software; rendering; scripts.

Abstract. The purpose of this research is to develop and use a virtual laboratory simulator to study methods and means of control and pressure regulation. Within the framework of this goal, the following tasks were solved: studying the process of monitoring and regulating pressure; development of a digital twin to study methods and means of pressure control and regulation. The research hypothesis is that the use of a virtual laboratory simulator to study methods and means of control and pressure regulation will optimize the learning process for students, increase the economic efficiency and stability of oil and gas production. Methods used in the study include literature and data analysis, mathematical modeling. As a result of the research, a digital twin was developed to study methods and means of control and pressure

regulation, which is applicable for training students and improving the skills of specialists in the oil and gas industry.

A.V. Saifutdinov

Application of Game Theory for Modeling Information Security Problems

Keywords: security; databases; game theory; cyber-attack; differential game.

Abstract. The purpose of the study is to investigate the features of using the game theory to model information security problems. It is noted that the main emphasis in protection is on ensuring the protection of nodes, databases, etc. However, cyber-attacks are becoming more frequent and more complex, which indicates the need to develop new approaches to their minimization. Scientific sources on game theory are analyzed to develop adaptive approaches to protecting information systems. A description of game-theoretic approaches and areas of their application for modeling information security problems is given. The possibilities of using differential games in modeling information security problems are considered.

D.O. Popov, A.N. Volkov

Research on Charging Modes of Mobile Transport Robots

Keywords: mobile transport robot is a robotic transport system; a mathematical model; battery operation mode; power consumption.

Abstract. The paper considers a way to increase the performance of the RTS by optimizing the battery operation mode. The goal is to increase the performance of the RTS by changing the charging mode of the battery (battery). The task is to study the dependence of the RTS performance on the battery operation mode. As a result of the study, using the approximating formula, the battery operation mode was optimized according to the criterion of maximum performance.

T.D. Ilinov, F.N. Semakin, A.A. Spiridonova, E.A. Belikova, E.G. Khomutova

From Design to Operation: How to Create an Effective Clean Room

Keywords: aseptic production; clean rooms; cleanliness class; design of clean rooms; GMP.

Abstract. The aim of this article is to develop the recommendations for the design of clean rooms focusing on the distinctive features of the clean room parameters in aseptic production from other areas. The hypothesis of the study is to confirm clean room will be properly performed its functions with proper design and compliance with all recommendations. Scientific methods used in this article: analysis, generalization. Special attention was paid to specifying the conditions and requirements are necessary to create effective clean rooms.

A.V. Kondrashova, R.I. Kuzmina

Water Treatment by an Adsorption Method

Keywords: adsorption properties; natural sorbent; purification; waste water; flask; silica; ammonium ions; modification; sorption capacity.

Abstract. This article is devoted to the study of the adsorption properties of natural silica flask of the Saratov deposit in the processes of water purification from ammonium ions. The authors proposed one of the ways to improve the adsorption properties and sorption capacity - modification of the surface of this sorbent (fraction 1–2 mm) by treatment with solutions of salts of transition metals: Co (II), Cd (II),

Al (III), Cu (II). The authors of the article conclude that the sorption process proceeds in two stages: external and internal diffusion.

Yang Qiang

Finite Element Analysis in Mechanical Engineering

Keywords: analysis; finite elements; mechanical engineering; application; computer programs; engineering calculations.

Abstract. The paper deals with the issues related to the analysis of finite element method in mechanical engineering. The aim of the study is to examine the finite element method and its application in mechanical engineering. The main methods of the study are: method of analysis, comparison, decision making, logical reasoning and many others. The definition of finite element method is studied. The author of the article emphasizes the importance and main advantages of using this method in practice. The spheres of application of this method in different areas of production are considered. The main stages of solving problems by the finite element method in mechanical engineering and their basic description are studied. An example of application of the finite element method in the calculation of welded structure of a section of a trunk pipeline is considered. As a result of the analysis with the use of various computer programs it was found out that there is a weak point in the pipeline section, which should be taken into account when designing the structure. The value of the calculated safety factor is less than one, which also indicates the need for increased attention to this product in the specified section. The author of the article concludes that finite element analysis is of particular value for carrying out calculations used later in the design of product structures, testing them for strength, etc.

Objective: The aim of the study is to investigate the finite element method and its application in mechanical engineering.

Methods: The main methods of the study are: method of analysis, comparison, decision making, logical reasoning and many others.

Findings: The finite element method and its application in mechanical engineering were studied. The use of this method is examined using an example and appropriate conclusions are drawn from the results of the study.

Conclusions: The analysis carried out has made it possible through the use of the finite element method to identify weaknesses in a pipe section. To compare the values obtained by using different computer programs and to justify the results obtained.

A.R. Glinscaya, D.V. Tikhonenko, A.V. Nizameeva

Structural Analysis of the Organization of the Processing Complex

Keywords: automated system; development of new technologies; business processes.

Abstract. In modern production conditions, automation plays a key role in increasing the efficiency and quality of production. The application of process automation is presented on the example of automation of one of the processes occurring in woodworking production. The purpose of the study is to automate the process at the production site of veneer husking about the measurements and calculations of the correctness of feeding the cylindrical log in the spindle and control the temperature of the core of the log in the husking machine and to design a system of husking machine. This paper will discuss the basic principles of the husking machine and its design methods to achieve optimal results in the veneer peeling process. Hypothesis of the study: automation of the veneer peeling process using the husking machine designed to measure and calculate the correctness of feeding the cylindrical log into the spindle and control the temperature of the log core will lead to increased productivity, reduced production costs and improved quality of the peeled product.

The State in the Formation of Human Capital of Civil Servants

Keywords: human capital development; civil servants; state; human resources.

Abstract. This article explores the problems of the development of human capital of state servants and the participation of authorities in its formation. An analysis of the methods of state influence on the formation of human capital is carried out, and proposals are made to improve these methods. The purpose of the study is to analyze the influence of the state on the formation and development of the human capital of civil servants. The task is to review and evaluate the functioning of human capital at various levels. The research hypothesis is that the need to form a new policy, where the state acts as an investor in labor resources, involves the creation and maintenance of conditions for sustainable development and the functioning of the personnel reserve. Methods such as studying sources of information, the collection of material, its analysis, generalization, comparisons, make it possible to conclude that the issue under consideration relevant and has a certain development potential. As a conclusion, it can be stated that the state plays an important role in the formation of human capital, acting as the main channel for realizing the accumulated potential.

T.G. Dolgova, A.V. Nizameeva, I.A. Pinchuk

Basics of Formation of Working Groups Created for Realization of the Enterprise IT Project

Keywords: IT projects; analytics; workgroups; management style; enterprise operations.

Abstract. This paper discusses the basics of forming workgroups that are created to successfully implement and integrate IT projects into the structure of an organization. It also considers the activities of people in the projects and the goals they pursue. The main problem of forming workgroups for project implementation is the formation of criteria for selecting employees, the variety of which is presented in the paper. To successfully form a working group it is necessary to evaluate the management style, taking into account the individual characteristics of each project.

I.S. Zharov

The Results of an Experimental Wearing of Lightweight High-Top Boots for Penitentiary Officers

Keywords: clothing items; experimental wear; questioning; items of clothing items; high-top boots.

Abstract. The purpose of the research is to evaluate the results of the experimental wearing of lightweight high-top boots for female employees of the penitentiary system conducted at the Vladimir Law Institute of the Federal Penitentiary Service of Russia in order to identify the advantages and disadvantages of newly introduced items of clothing. The research methods of direct experimental wear, a survey of wear participants (respondents), and analysis of questionnaires were used. The results of experimental wear showed that lightweight women's high-top boots meet the basic requirements for this clothing item. The experimental wear made it possible to evaluate the quality and convenience of wearing the newly introduced items of clothing when used by cadets of the Vladimir Law Institute of the Federal Penitentiary Service of Russia. The conducted research testifies to the expediency of using the questionnaire as an additional tool for the formation of the initial data array, the analysis of which contributes to the development of new high-quality items of clothing for the employees of the penitentiary system.

O.Yu. Orlova, T.I. Leonova, N.V. Valebnikova

Quality Assurance of the Organization's Business Continuity

Keywords: quality management system; business continuity management; crisis management.

Abstract. The study aims to formulate recommendations on the formation and implementation of the Business Continuity Plan of the organization, based on the requirements of modern standards in the field of quality management system and business continuity management system. The research objectives are to determine the principles for the development of complex measures in the organization's quality management system, the implementation of which will ensure the smooth functioning of the enterprise and develop modern tools for managing the risks of stopping production activities. The hypothesis of the study is that the management of probable threats of disruption of key production processes in the quality management system is impossible without the development and implementation of documented business continuity plans, which should include a clear and consistent algorithm of actions for corporate team members aimed at timely identification of such risks and threats, as well as eliminating the consequences of their implementation. The research methods include logical methods of analysis and economic observation.

The results of the study can be taken as a basis for developing measures aimed at improving the quality of risk management of disruption of production processes by organizations for which ensuring business continuity and people's safety is a fundamental principle of maintaining the integrity of economic ties and cooperation.

D.V. Kharitonov, A.N. Silkin, I.S. Atrokhin

The Relevance of the Use of Accounting Systems for the Results of Intellectual Activity of Employees of a Research and Production Enterprise

Keywords: company management; organization of production; results of intellectual activity; accounting systems of scientific activity; scientific and production enterprise.

Abstract. The purpose of the study is to develop recommendations for improving the accounting systems of scientific activity based on the analysis of the effectiveness of use in a scientific and production organization and further creation of additional levers of employee motivation based on them. This article examines the relevance of using the accounting of scientific activity based on the existing needs and capabilities of the system, as well as the conditions and the possibility of their use to solve problems related to the evaluation of the performance of employees. The analysis of trends is presented, possible problems in the process of application, development options are proposed within the framework of a research and production enterprise.

L.N. Ridel, T.V. Dubrovskaya, I.V. Shadrina, E.V. Kostoustova

The Analysis of the Use of Artificial Intelligence in the World Practice

Keywords: analysis; artificial intelligence; global economy; areas of application; financing; costs; efficiency.

Abstract. The purpose of the study is to conduct a comparative analysis of the use of artificial intelligence in world practice. To achieve the goal, it is necessary to complete the following tasks: to

identify the main areas of scientific research in the field of artificial intelligence, to identify the areas of its application, to assess the level of costs for the creation of artificial intelligence technologies. The research hypothesis is based on the assumption that one of the fastest growing markets is the market for artificial intelligence systems and technologies. In the course of the study, methods of statistical analysis were used: assessment for compliance with the law of normal distribution, correlation analysis. The conclusions and recommendations obtained from the results of the study will allow us to assess the level of development of the market for artificial intelligence systems and technologies.