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SYSTEM ANALYSIS, CONTROL AND INFORMATION PROCESSING

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DOI 10.46418/2619-0729_2022_4_1

METHOD OF NUMERICAL PREDICTION OF DEFORMATION PROCESSES OF SEWING MATERIALS

The article discusses methods of numerical prediction of deformation processes of sewing materials for various purposes. As an example, the application of this method in the numerical prediction of deformation processes of workwear fabrics used for the manufacture of personal protective equipment against external mechanical influences is given.

Keywords: numerical forecasting, sewing materials, deformation processes, relaxation processes.

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STUDY OF THE INFLUENCE OF DEFORMATION ON THE PERFORMANCE PROPERTIES OF GEOTEXTILE NONWOVEN MATERIALS

The article considers the influence of plastic, elastic and viscoelastic deformation components on the performance properties of geotextile nonwoven materials used in road construction.

Keywords: deformation, geotextile nonwoven materials, operational properties, mathematical modeling.

A. V. Demidov, A. G. Makarov

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SPECTRAL ANALYSIS OF DEFORMATION PROCESSES OF GEOTEXTILE NONWOVEN MATERIALS

The article discusses the method of spectral analysis of the operational processes of creep of geotextile nonwoven materials based on the numerical calculation of the delay spectra of these materials for a mathematical model for predicting deformation processes. A theoretical substantiation of the assumption about the smallness of the statistical delay times of geotextile nonwoven materials is given.

Keywords: spectral analysis, geotextile nonwoven materials, deformation processes, mathematical modeling.

MACHINES, AGGREGATES AND TECHNOLOGICAL PROCESSES

A. Yu. Ataeva, G. I. Sverdlik, D. A. Kambolov, A. R. Ataev

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DEVELOPMENT OF A PROCESS LINE FOR PURIFICATION OF DUST AND GAS EMISSIONS CONTAINING NANOPARTICLES

The article discusses scientific developments for the implementation of a new bubbling method for capturing dust and gas emissions containing fine dust, including nanoparticles. The design features of the jet sparger, developed on the basis of laboratory studies, and its advantages over other sparging apparatuses are considered. The design of the bubbler is based on the principle of collision of gas-liquid jets. For testing a prototype jet sparger in a gas purification process line, a circuit diagram of the apparatus has been developed.

Keywords: technological line, jet bubbler, wet cleaning, distribution plate, nanoparticles.

L. V. Smirnov, N. N. Kokushin, A. P. Batenev, E. A. Efimov

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GEARS FROM POLYMERIC MATERIALS

The article considers gears created using three-dimensional printing from different types of plastic. A series of experiments were conducted to identify the best type of plastic in the manufacture of three-dimensional models of gears.

Keywords: gear wheel, plastic, deformation, experiment.

M. S. Chepchurov, B. S. Chetverikov, N. S. Ljubimyj, A. S. Luk'janov

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STRUCTURE OF THE AUTOMATED COMPLEX FOR SORTING FRUIT AND VEGETABLE PRODUCTS

The aim of the research is to ensure the productivity of the sorting process through the use of a modular structure of an automated sorting complex. The main task, to which the article is devoted, is the development of the structure of an automated complex for sorting fruit and vegetable products by size with simultaneous control of their weight. To achieve this goal, an automated sorting complex scheme, interpreted on the basis of the analysis of various scientific sources, as well as an unloading device scheme developed by the authors, is proposed. As research methods, an analysis of world practice in the field of sorting, as well as existing designs and schemes of technological lines for sorting vegetables and fruits, was chosen, as a result of which their advantages and disadvantages were identified. The revealed relationship between the performance of the sorting complex and the procedure for unloading containers allows us to correctly set the logistical problem of moving the product from the technological conveyor to unloading the product and its further sorting.

Keywords: sorting, automation, scheme, performance, fruits and vegetables.

I. A. Semikopenko, D. A. Belyaev, V. P. Voronov, D. V. Vavilov

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DESCRIPTION OF THE PROCESS OF GRINDING MATERIAL PARTICLES IN THE WORKING CHAMBER OF A CENTRIFUGAL DISC GRINDER

This article discusses the process of grinding in the grinding chamber of a centrifugal disc grinder in order to determine the analytical relationship between the particle size of the material and the design and technological parameters of the grinder, as well as the distance traveled by the particle along the lower blade of the grinder. The conclusion of this dependence is made on the basis of the grinding function, which describes the change in the mass of the particle when the last impact energy is applied, and the grinding function, which describes the destruction of the particle at each point during the time spent on the grinder blade. Based on the ratio obtained, a graphical dependence was constructed that characterizes the change in the particle size of the material from the distance traveled by the particle along the lower shredder blade. The results of this article can be used in the design of centrifugal disc grinders, as well as in the educational process.

Keywords: centrifugal disc grinder, rotation frequency, grinding chamber, radial blade, material particle.

PRODUCT QUALITY CONTROL. STANDARDIZATION. ORGANIZATION OF PRODUCTION

P. A. Shikov, D. A. Ermin, Yu. A. Shikov

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ADOPTION OF ORGANIZATIONAL AND TECHNICAL DECISIONS IN THE MANAGEMENT OF A LIGHT INDUSTRY ENTERPRISE

The article examines the problems of making organizational and technical decisions in the process of managing a light industry enterprise. The main components of the evaluation of the decision-making process by the enterprise are analyzed. On the example of the sewing enterprise LLC "Knitting Factory", the processes of making organizational and technical decisions are investigated. Their effectiveness is evaluated by analyzing the relationship of corporate governance with the main business processes of a light industry enterprise. The main stages of the communication solution in the management of a sewing enterprise are described. An expert assessment of the indicators of the effectiveness of decisions taken in the field of management of LLC "Knitting Factory" is given. The main parameters of the analysis of the effectiveness of management decisions are considered. An example of a component of the evaluation of the decision-making process - the management structure of the project department is given. It is concluded that organizational and technical solutions are aimed at strengthening the competitiveness of the company and improving the efficiency of business process management of the sewing enterprise

Keywords: organizational and technical solutions, corporate governance, management decision-making, management efficiency, sewing enterprise.

R. S. Sychev, Yu. Yu. Cheremuhina

DOI 10.46418/2619-0729_2022_4_9

PROCESS CONTROL OF DESIGN OF RES IN THE SYSTEM OF MANAGEMENT OF LEAN PRODUCTION

The question of the state of the economy of the enterprise in the production of modern tools of lean production in the management of design work of the RES is considered. A method has been developed for managing the design process of RES, indicating the requirements and quality criteria in accordance with the requirements of the GOST R 56407–2015 standard. The developed recommendations for standardization of the design process of RES allow achieving the goals of lean production and successfully setting up a lean production system on a desktop computer.

Keywords: process control, lean production management system, quality indicators and criteria.

E. E. Smirnova, D. A. Radushinsky, D. A. Kremcheeva

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PRIORITY TASKS OF STANDARDIZATION IN THE FIELD OF HYDROGEN TECHNOLOGIES

The article discusses the priority areas of harmonization of standards for the development of hydrogen energy in Russia.

Keywords: standardization, hydrogen energy, harmonization of standards.

K. V. Kaisheva

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THE MODERN RESEARCH DIRECTIONS WITHIN THE TOPIC OF SPORTSWEAR QUALITY MANAGEMENT (THE REVIEW)

The article presents the results of bibliometric analysis of the articles cited in the Scopus database and the scientific electronic library eLIBRARY.RU published since 2016. The analysis of publications allowed to identify the main areas of research and the leading tendencies, including the development of wearables and functional materials with predefined properties; new methods for exploring and predicting properties; assessment methods of

quality and ergonomics; information technologies for sportswear design and anthropometry, and others.

Keywords: sportswear, quality evaluation, bibliometric research.

A. V. Knyazev, Yu. Yu. Cheremukhina

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THE PROBLEMS OF DEVELOPING STANDARDS TO ENSURE THE DEVELOPMENT OF METAVERSES

The article covers the issues of the possibilities of the development of metaverses with the use of the normative and methodological base of standardization. A literary review of the properties of augmented reality technologies is carried out. The topical issues of preparation of standardization documentation necessary to ensure the development of metaverses are highlighted.

Keywords: standardization, mixed reality, virtual reality, augmented reality, industry 4.0, metauniverse, big data.

E. A. Skorniakova, K. V. Zolotukhin

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METHODOLOGY OF COMPONENTS QUANTITY CALCULATION TO ENSURE CERTAIN LEVEL OF FLEXIBILITY

The process of modification flexibility ensuring and its subprocesses has been analysed, an algorithm and a software solution have been developed which allow to carry out calculation on the basis of the applicability matrix for different product configurations and significantly reduce the time required to calculate components quantity for ensuring of certain level of flexibility.

Keywords: automation, lean manufacturing, flexibility, flexible production, modification flexibility.

A. V. Arkhipov, D. E. Platonov

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EVALUATION OF THE PERFORMANCE OF THE TECHNOLOGICAL NETWORK BY THE VALUE OF THE MAXIMUM FLOW

The problem of evaluating the performance of a group of technological machines performing work flow operations moving along their routes is considered. Such a group of machines is called a technological network. It is shown that an algorithm based on the well-known Ford-Fulkerson theorem on the maximum flow through the network with known estimates of the bandwidth of arcs can be used to evaluate the network performance after a number of transformations that take into account its specifics. The rationale, the order of implementation and examples of the application of the algorithm are given. The algorithm can be used in assessing the production capabilities of machine complexes when justifying production plans, as well as plans for the technological development of an enterprise with a serial type of production and a wide range of products.

Keywords: technological network, machines, productivity, model, graph, vertices, arcs, section, maximum flow

TECHNOLOGY AND PROCESSING OF SYNTHETIC AND NATURAL POLYMERS AND COMPOSITES

I. Yu. Ivanova, N. P. Midukov

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CRITICAL ANALYSIS OF 3D SCANNING METHODS FOR REVERSE ENGINEERING OF EQUIPMENT PARTS OF THE STOCK PREPARATION DEPARTMENT OF PAPER PRODUCTION

The article presents the main methods of 3D-scanning of details of a complex shape. Particular attention is paid to the choice of a 3D-scanning method for the parts of the equipment of the stock preparation department. The result of a critical analysis of 3D-scanning methods is practical recommendations for choosing a scanner that allows you to quickly and efficiently create 3D-models on the basis of which technical documentation is developed for subsequent serial production. The work presents the features of laser, optical, contact methods of 3D-scanning. Each of the methods was evaluated by scanning accuracy, speed, number of points, usability of the 3D scanner, etc.

Keywords: 3D-scanning, equipment parts, additive technologies, stock preparation department of paper production.

M. A. Midukova, A. G. Kuznetsov, N. P. Midukov, E. E. Korotkova, D. V. Inyakina

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INFLUENCE OF VARIOUS METHODS OF RECOVERED PAPER DEINKING ON OPTICAL PROPERTIES OF PAPER

The article is devoted to assessing the effectiveness of recovered paper deinking using various technologies. Information is given on the influence of the use of enzymes of domestic production on the process of flotation of recovered paper. In addition, the most common chemical kits in flotation in production are considered, namely the use of sodium silicate or flotation based on sodium dithionite. Particular attention is paid to flotation using enzymes in combination with the technology of preliminary dry grinding of recovered paper. The effectiveness of deinking technologies was assessed by determining optical properties, namely: whiteness, brightness, opacity, fluorescence. Based on the experimental studies carried out, practical recommendations were developed for deinking of recovered paper.

Keywords: toner, enzymes, whiteness, brightness, opacity, flotation, dry defibration.

TECHNOLOGY OF PRODUCTION OF TEXTILE AND LIGHT INDUSTRY PRODUCTS

N. V. Pereborova

DOI 10.46418/2619-0729_2022_4_17

METHODOLOGY OF MATHEMATICAL SIMULATION OF OPERATING AND RELAXATION PROCESSES OF POLYMERIC TEXTILE MATERIALS

The article describes the methodology of mathematical modeling of operational-relaxation processes of polymeric textile materials. The main operational-relaxation process of polymeric textile materials are the processes of relaxation and restoration of shape. To realize the possibility of predicting operational-relaxation processes, it is necessary to have adequate mathematical models of these processes.

Keywords: mathematical modeling, polymeric textile materials, deformation processes, relaxation processes.

N. V. Pereborova

DOI 10.46418/2619-0729_2022_4_18

DEVELOPMENT OF METHODS FOR MATHEMATICAL MODELING OF DEFORMATION PROCESSES OF POLYMERIC TEXTILE MATERIALS

The article describes methods of mathematical modeling of deformation processes in polymeric textile materials. The main deformation process in the processes of polymeric textile materials is creep. To implement the possibility of predicting the deformation process, it is necessary to have an adequate mathematical model of this process.

Keywords: mathematical modeling, polymeric textile materials, deformation processes, relaxation processes.

N. V. Pereborova, N. S. Klimova

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ACCOUNTING FOR THE IRREVERSIBLE DEFORMATION COMPONENT IN PREDICTION OF DEFORMATION PROCESSES OF GEOTEXTILE NONWOVEN MATERIALS

The article considers a method for determining the component of irreversible deformation of geotextile nonwoven materials, which is essential for improving the accuracy of predicting their deformation processes.

Keywords: deformation, geotextile nonwoven materials, deformation processes, mathematical modeling.

M. A. Kanevskiy

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COMPARATIVE ANALYSIS OF THE USE OF ARDUINO-BASED MICROCONTROLLERS FOR THE MANUFACTURING OF WEARABLES

For many years now, the fashion world has been actively bridging the gap between technology and the consumer, creating a new archetype – wearables. One of its types is textiles, with electronic components, which are embedded in garments. In this article, we will evaluate and compare the popular printed circuit boards on the Arduino platform according to several criteria - functionality, ease of programming and sewability.

Keywords: clothing, e-clothing, smart textile, wearables, design, programming microcontrollers, Arduino, AdaFruit, Gemma Mo, LilyPad, MakeCode, CircuitPython.

N. P. Bodryakova, M. V. Gorbacheva , O. A. Strepetova

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PROBLEMS OF PRESERVING THE QUALITY OF WOOL AS A RAW MATERIAL FOR THE TEXTILE INDUSTRY

The present article is devoted to the study of microbial contamination of natural wool during storage. Today, textile production, as well as other sub-sectors of light industry, is experiencing a few difficulties of economic, technological and environmental nature. Given the considerable popularity of wool products among consumers, the research aimed at studying biological factors, which reduce qualitative characteristics of natural wool, is of particular importance and relevance. The object of the research is thin sheep's wool, as the most valuable and sought-after type of raw material for textile production. Particular attention is paid to the microbiological degradation of wool fiber during storage. The results of the study of bacterial contamination of wool by reductase sample and spectrophotometric analysis are given. Thus, when estimating the influence of microbiological processes on the insemination of sheep wool, it has been established that, depending on the degree of bacterial damage of wool fibers, the color of water extracts changed smoothly from purple ($D=0,93$) in wool samples before storage to pale lilac ($D=0,30$) after 7 weeks of storage at elevated temperatures and humidity. The intensity of activation of microorganisms in case of violation of hydrothermal storage conditions of fine sheep wool has been proved. The dependence of the value of optical density of stained solutions with extracts from wool fiber samples after

reductase sampling on the storage time of raw materials was revealed. The effect of microflora on the external structures of wool fibers has been studied by the method of electron scanning microscopy. The degree of contamination of fine sheep wool under storage conditions was experimentally established, which increased by almost 20 thousand times over the exposure period of the research.

Keywords: textile industry problems, fine sheep wool, commodity properties of wool, storage regimes, wool contamination, wool destruction, product safety.

I. A. Sheromova, I. A. Slesarchuk

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APPLICATION OF TYPICAL DESIGN METHODS IN CREATING TIGHT-FITTING CLOTHING MODELS FROM HIGHLY ELASTIC MATERIALS

The article presents and describes the results of research related to the formation and systematization of the initial information and the rationale for the choice of compositional solutions for tight-fitting garments made of highly elastic knitted fabrics, as well as the development of their typical structural modules in accordance with the main approaches underlying the modular design of clothing models.

Keywords: Highly elastic materials, tight-fitting garments, typical design of clothing models, design of a system of models synthesized from modules, ways to achieve visual artistic and constructive distinction between models, compositional and structural modules.

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