TABLE OF CONTENTS

SYSTEM ANALYSIS, CONTROL AND INFORMATION PROCESSING

materials according to the criteria for best compliance with their functional purpose.
Keywords: parachute canopies, polyamide fabrics, viscoelasticity, deformation, mathematical modeling, numerical forecasting, system analysis.

A. V. Demidov, A. G. Makarov
MATHEMATICAL MODELING AND SYSTEM ANALYSIS OF DEFORMATION
PROCESSES OF POLYMER TEXTILE MATERIALS
The article describes the methodology for mathematical modeling of deformation processes of polymer textile materials, which are actively used in many fields of technology. A mathematical model of deformation processes in polymer materials is, as a rule, a system of equations regarding the determined characteristics, associated with additional conditions. To obtain a unique solution to the system, it is necessary to set parameters, which can be experimental data obtained in the laboratory.
Keywords: polymer textile materials, deformation processes, forecasting, mathematical modeling.

N. V. Pereborova
SYSTEM ANALYSIS OF OPERATING PROCESSES OF POLYMER PARACHUTE
SLANGS
A systematic analysis of the operational processes of polymer parachute lines allows us to identify patterns of their dynamic behavior during the operation of parachutes, which is extremely important for conducting a qualitative analysis and assessment of the functional and operational properties of developed and existing parachute systems. On the basis of the specified system analysis, computer forecasting of stress relaxation and creep processes of the materials under study, fundamental in the theory of viscoelasticity, is also carried out.
Keywords: parachute lines, viscoelasticity, deformation, relaxation, creep, mathematical modeling.

N. A. Merzlyakova
BUILDING RATING SYSTEMS FOR EVALUATING THE EFFECTIVENESS OF
UNIVERSITIES
Two different approaches for constructing a comprehensive assessment of the effectiveness of universities are proposed. The first one is based on multivariate statistical analysis of the data from the annual University Annual Monitoring using correlation analysis and the principal component analysis. The method was applied to several sets of universities, composed either on a territorial basis or on belonging to state projects, etc. Another method is based on a set of indicators, the comparative significance of each of them reflecting the priorities of a specific industry profile. The significance of indicators is based on expert assessments and fuzzy and non-numeric data. A model describing comprehensive assessment of efficiency using the method of weights randomization is proposed.
Keywords: monitoring, efficiency of the activities of higher educational institutions, principal components analysis, complex indicator of the efficiency, rating estimation, expert assessment analysis, non-numeric and fuzzy information, randomization of weighting coefficients.

A. G. Makarov
SYSTEM ANALYSIS AND COMPUTER PREDICTION OF VISCOELASTICITY OF
ARAMID TEXTILE MATERIALS
Methods of system analysis and computer prediction of viscoelasticity of aramid textile materials

are considered. Computerization of methods for predicting the viscoelasticity of aramid materials based on mathematical modeling of their deformation properties is inextricably linked with solving problems of comparative analysis of material properties, with studies of the relationship between properties and structure, with targeted technological regulation of properties, as well as with the prediction of short-term and long-term mechanical effects.

Keywords: viscoelasticity, aramid textile materials, mathematical modeling, computer forecasting.

N. V. Pereborova, A. A. Kozlov
APPLICATION OF SYSTEM ANALYSIS METHODS IN PREDICTING THE DEFORMATION PROPERTIES OF ARAMID MATERIALS WITH COMPLEX STRUCTURE

The application of methods of system analysis and mathematical modeling to study the deformation properties of aramid materials of complex structure is considered. Computerization of forecasting deformation processes of these materials allows for a qualitative comparative analysis and optimal technological selection of aramid materials of complex macrostructure based on quality performance characteristics.

Keywords: aramid materials, viscoelasticity, deformation processes, mathematical modeling, system analysis, computer forecasting.

MACHINES, AGGREGATES AND TECHNOLOGICAL PROCESSES

P. E. Stepanov
DETERMINATION OF THE EXTERNAL INFLUENCE MODEL IN A ROBUST ALGORITHM FOR CONTROLLING FORCED MOTION IN THE CONTROL SECTION OF THE REWINDER MACHINE

The article discusses the issue of determining the state matrix of the external influence model in a robust forced motion control algorithm using the example of the control section of a rewinding machine. The frequency response of a closed-loop model based on the disturbing influence was determined. Various options for optimality criteria are given.

Keywords: robust control, frequency response, nonlinear oscillations.

S. Yu. Lozovaya., E. S.Bashcheva
IMPROVING THE EFFICIENCY OF PARTICLE CLASSIFICATION IN A PRESSURE-TYPE HYDROCYCLONE BY ORGANIZING A SEPARATION AREA IN THE WORKING AREA

The scientific study considers the process of hydroclassification of pyrite cinder for their further use in the preparation of Portland cement clinker. The aim of the study is to increase the efficiency of particle classification in a pressure-type hydrocyclone with a separation area in the working area, using the method of engineering design and modeling of the hydrodynamic process in a CAD/CAE system. Computer modeling of processes is relevant when creating new devices, which makes it possible to analyze their operability and variable performance at the design stage. The object of the study is a digital model of a new hydrocyclone that allows to capture particles smaller than 60 microns. Its modified branch pipe accepts two streams of liquid with different densities, one of which in the cylindrical part allows large pulp particles to be removed from the separation area to the lower drain, which makes it possible to direct the necessary particle fraction to the upper drain. In this paper, the advantages and disadvantages of pressure-type devices are considered, a new design of a hydrocyclone of pressure-type is

proposed, and a simulation of the hydrodynamic process in a modified hydrocyclone is carried out. The analysis of the results of modeling the hydrodynamic process is presented, which confirmed the high efficiency of using a pressure hydrocyclone with a separation area in the working area.
Keywords: hydroclassification, particle separation efficiency, design, CAD/CAE system, energy intensity.

V. G. Khorkov, E. G. Smirnova
DOI 10.46418/2619-0729_2023_4_12
USE OF SHOE PRESSES IN PULP AND PAPER PRODUCTION IN RUSSIA (REVIEW)
The article summarizes the history of paper and paperboard compression. The processes that take place in the paper when pressing in the shoe press are considered. Data on installed shoe presses in Russia are given. Diagrams of installation of shoe presses in the production of various types of paper and cardboard are shown.
Keywords: shoe press, pressing impulse, pressing profile, paper, cardboard.

M. S. Chepchurov, B. S. Chetverikov, N. S. Ljubimyj, A. S. Luk'janov
DOI 10.46418/2619-0729_2023_4_13
THE CONNECTIONS IN THE AUTOMATIC SORTING LINE OF FRUITS AND VEGETABLES PRODUCTS
The article discusses the development of a methodology for the rational implementation of software, based on a mathematical model of the consistency of task groups and performers. The advantage of the proposed method is that it allows you to determine in advance the optimal number of personnel for effective management of information operations at the operational stage, after establishing this rational ratio of performers, it is possible to fine-tune the distribution of tasks and assignments, using the changing dynamics of indicators for processing technological tasks.
Keywords: mathematical modeling, mixed groups of performers, neural network, artificial intelligence, implementation methodology, large language models.

PRODUCT QUALITY CONTROL. STANDARDIZATION. ORGANIZATION OF PRODUCTION

K. A. Soloveichik, P. A. Arkin, V. E. Sousov, V. D. Makarenko
DOI 10.46418/2619-0729_2023_4_14
DEVELOPMENT OF SOFTWARE IMPLEMENTATION METHODOLOGY BASED ON LARGE LANGUAGE MODELS IN THE HIGH TECHNOLOGY PRODUCTION
The article discusses the issues of conducting a qualitative analysis of the elastic, viscoelastic and plastic properties of polymer parachute lines. These three components together represent a complete set of deformation effects during parachute operation.
Keywords: mathematical modeling, computer forecasting, polymer parachute lines, elasticity, viscoelasticity, plasticity.

A. G. Makarov, S. V. Kiselev
DOI 10.46418/2619-0729_2023_4_15
QUALITATIVE ANALYSIS OF ELASTIC, VISCOELASTIC AND PLASTIC PROPERTIES OF POLYMER PARACHUTE SLINGS
The article discusses the issues of conducting a qualitative analysis of the elastic, viscoelastic and plastic properties of polymer parachute lines. These three components together represent a complete set of deformation effects during parachute operation.
Keywords: mathematical modeling, computer forecasting, polymer parachute lines, elasticity, viscoelasticity, plasticity.

TECHNOLOGY AND PROCESSING OF SYNTHETIC AND NATURAL POLYMERS AND COMPOSITES

M. A. Midukova, E. M. Freidkina, A. V. Vlasov, T. V. Dubrovina
TECHNICAL AND ECONOMIC ASSESSMENT OF THE INTRODUCTION OF OFFICE RECOVERED PAPER DEINKING TECHNOLOGY TO HOMELAND FACTORIES

Technical and economic assessment of the introduction of office recovered paper deinking technology to homeland factories is devoted to the technical and economic assessment of the introduction of office recovered paper deinking technology to homeland factories. An approximate calculation of the cost of equipment for deinking office recovered paper from toner in the conditions of production of two-layer cardboard for covered layers of corrugated cardboard with a white top layer at JSC Karavaevo is given. The modernization of the stock preparation department for the production of the top layer of cardboard is proposed, aimed at introducing a flotation plant, three additional pumps and a thickener into the existing flow and installations for two-stage dry dispersion of office recovered paper by patented technology. According to the results of technical and economic indicators, the annual volume of office recovered paper was established, which must be collected in order to recoup the investment. According to calculations (for the current conditions, taking into account the manufacture of equipment at homeland enterprises in conjunction with the purchase in China), it was found that for enterprises located near a large metropolis, it is economically feasible to switch to the production of cardboard with a white layer.

Keywords: test-liner, cardboard, recovered office recovered paper, toner, technical and economic assessment.

TECHNOLOGY OF PRODUCTION OF TEXTILE AND LIGHT INDUSTRY PRODUCTS

A. A. Kozlov
MATHEMATICAL MODELING AND COMPUTER PREDICTION OF RELAXATION AND DEFORMATION PROCESSES OF POLYAMIDE FABRICS FOR PARACHUTE DOMES

The article describes methods of mathematical modeling and computer prediction of relaxation and deformation processes of polyamide fabrics for parachute canopies. Based on the above methods, it is possible to carry out technological selection of these materials that have specified relaxation and deformation properties.

Keywords: parachute canopies, polyamide fabrics, viscoelasticity, deformation, mathematical modeling, numerical forecasting, system analysis.

S. Yu. Boyko, A. A. Zavyalov, G. G. Sokova
ON THE ISSUE OF INCREASING THE EFFICIENCY OF USE OF TEXTILE RAW MATERIALS

The efficiency of cotton spinning production mainly depends on the rational use of raw materials, since raw materials account for more than 80% of production costs. Therefore, reducing the cost of raw materials is an important condition for reducing the cost of production, increasing the profit of the enterprise and profitability. The need for raw materials and the cost of yarn are determined in the balance of raw materials. Due to the need to ensure efficiency, high quality and speed of calculating the balance of raw materials, modern software products are used. The MathCad programming environment was chosen as the software product. This environment was chosen due to the fact that it allows you to visualize the calculation process

well and quickly make changes to it, as well as present the calculation results in a convenient form. Testing of the developed software product was carried out on the basis of data from the spinning production of a textile enterprise in the city of Kamyshin. The use of this program in production has shown the ability to quickly make changes to the source data, which ensures high speed and accuracy of calculations.

Keywords: spinning production, automated calculation, balance of raw materials.

S. V. Kiselev, A. A. Kozlov
MATHEMATICAL MODELING OF RELAXATION AND DEFORMATION PROPERTIES OF POLYMER PARACHUTE SLINGS

The article studies the issues of mathematical modeling of relaxation and deformation properties of polymer parachute lines. The developed mathematical models are of paramount importance for further comprehensive qualitative assessment of the functionality of the materials being studied.

Keywords: parachute lines, polymer materials, relaxation, deformation, mathematical modeling, numerical forecasting, system analysis.

S. V. Kiselev, I. M. Egorov
METHOD FOR DIGITAL PREDICTION OF DEFORMATION PROCESSES OF TISSUE FOR TECHNICAL PURPOSE

The article provides a description of the various types of special shoes used by athletes for training and performing at competitions in various types of gymnastics in order to develop scientifically based requirements for their design in the context of the specifics of each type of gymnastics. Some sports types of gymnastics and the features of performing exercises and elements, as well as the corresponding types of special shoes used by athletes at the present time, are considered.

Ключевые слова: special shoes, design features, properties, types of gymnastics.

V. A. Parakhin, E. V. Litvin, V. A. Parakhin
ON THE ISSUE OF RESEARCH AND IMPROVEMENT OF THE DESIGN OF SPECIAL FOOTWEAR FOR SPORTS GYMNASTICS

Using the example of technical fabric used as the inner layers of protective helmets to protect the human head from injury, digital prediction of the deformation process is considered. The presented methodology is based on mathematical modeling of the creep process and makes it possible to predict with a sufficient degree of accuracy the deformation processes of sewing materials, including deformation-recovery processes of any degree of complexity, which gives grounds for technological selection of fabrics that have the specified impact-resistant characteristics even at the product design stage.

Keywords: deformation, creep, viscoelasticity, sewing materials, forecasting, recovery processes, technical fabrics.

T. A. Zaytseva, L. A. Koroleva, I. A. Slesarchuk, I. L. Klochko
DESIGNING ADAPTIVE CLOTHING FOR PATIENTS WITH LIMB INJURIES DURING REHABILITATION BY THE ILIZAROV METHOD

At present, the design of clothing for patients with limb injuries during rehabilitation by the Ilizarov method is an acutely demanded topic. In the article, based on the analysis of the competitive environment, the operating conditions of the design object and the needs of the target audience, the

requirements for the product are formed. The result of the stages of design work was the production of prototypes and their subsequent testing.
Keywords: adaptive clothing, Ilizarov apparatus, ergonomics, psychophysiological comfort.

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