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The article presents a variant of solving the problem of quality control of polymeric materials in the textile and light industry, which is based on an integral criterion for the quality of the deformation properties of the materials under study.
Keywords: product quality, production of textile materials, information technology, optimization criteria, mathematical modeling, production management, quality management.

M. B. Sukhanov
DOI: 10.46418/2619-0729_2022_1_5
ESTIMATION OF THE VOLUME OF POLYESTER FIBER PRODUCTION FROM WASTE USING FUZZY SET THEORY
This article discusses the environmental aspects of processing polyethylene terephthalate into polyester fiber. To quantify the total volume of production by several plants, a fuzzy model is proposed that takes into account that some of the products are exported and there is uncertainty in the initial data. In this study, the product is polyester fiber obtained from waste.
The interpretation of fuzzy numbers in the estimation of production volumes is given. Membership functions are constructed for the considered fuzzy variables. Trapezoidal ones are chosen as such functions. When organizing resource-saving and ecological production systems for building fuzzy models with membership functions, compared with MS Excel, it is more efficient to use the MATLAB computer mathematics system.
Keywords: organization of production, eco-friendly materials, light industry, chemical industry, polyester fiber, synthetic fibers, fuzzy numbers, fuzzy set theory

MACHINES, AGGREGATES AND TECHNOLOGICAL PROCESSES

N. V. Pereborova, S. V. Kiselev
DOI: 10.46418/2619-0729_2022_1_6
SPECTRAL SIMULATION OF DEFORMATION AND RELAXATION PROCESSES OF POLYMERIC TEXTILE MATERIALS
The article considers the methods of spectral modeling of deformation-relaxation processes of polymeric textile materials. The development of new methods for studying the deformation-relaxation processes of polymeric textile materials contributes to the most reliable prediction of their functional properties.
Keywords: polymeric textile materials, deformation-relaxation processes, spectral modeling, numerical prediction

A. E. Anufriev, A. V. Markovets, N. V. Rokotov, A. G. Usov
DOI: 10.46418/2619-0729_2022_1_7
MATHEMATICAL MODELING OF THE ROLL UNWINDING PROCESS CONSIDERING THE TENSION FORCE OF THE MATERIAL BEING UNWOUND
The process of unwinding a fabric rolled into a roll is considered. The cross section of the roll is a convex figure, the shape of which is given by two factors that distinguish it from a circle. The elastic web can stretch in the unwinding area. There were compiled differential equations for the dynamics of the rotational movement of the roll and changes in the tension force of the web. Numerical integration of differential equations for unwinding a roll of fabric is performed using the example of sizing and sorting machines. The influence of the factors of eccentricity and ellipticity on fluctuations in the values of the angular speed of unwinding and the tension force of the web has been studied.
Keywords: roll material, roll unwinding dynamics, roll cross section, tension force, elastic web

SYSTEM ANALYSIS, CONTROL AND INFORMATION PROCESSING

TECHNOLOGY AND PROCESSING OF SYNTHETIC AND NATURAL POLYMERS AND COMPOSITES

S. V. Aniskin, V. S. Kurov
DOI: 10.46418/2619-0729_2022_1_12
POLYDISPERSE MODEL OF MIXING IN THE EJECTION ZONE OF DIRECT-FLOW SPRAY APPARATUSES OF THE PULP AND PAPER INDUSTRY
The paper presents a theoretical construction of a model of the flow of a gas-liquid jet in a direct-flow spray displacement apparatus in the production of cellulose. The model, based on the similarity of the gas jet velocity distribution to the irrigation density distribution, allows us to take into account the peculiarities of the gas-liquid jet flow in four flow zones of the apparatus, including in the ejection zone with the wall circulation of the gas stream. The conditions of the occurrence of wall circulation and the occurrence of a pressure surge are considered. Experimental confirmation of the theoretical model was obtained on a laboratory bench.
Keywords: direct flow, liquid, jet, gas, droplets, model, polydispersity, speed, irrigation density, wall circulation

S. V. Aniskin, V. S. Kurov
DOI: 10.46418/2619-0729_2022_1_13
DEVELOPMENT OF HIGH-RELIABILITY DIRECT-FLOW SPRAY DEVICES COMPATIBLE WITH PULP AND PAPER PRODUCTION TECHNOLOGY
The paper presents technical solutions to the problem of improving the reliability of high-performance direct-flow spray machines in relation to the features of pulp and paper production technology. Full-scale industrial samples of high-reliability direct-flow spray devices have been developed. Industrial tests were carried out at various pulp production enterprises.
Keywords: Apparatus, jet, liquid, gas, droplets, nozzle, sprayer, insert, swirler, mud filter

M. A. Litvinov, T. I. Efremov
DOI: 10.46418/2619-0729_2022_1_14
EVALUATION OF THE STUDY EFFECTIVENESS OF THE PAPER AND CARDBOARD BY DIGITAL TECHNOLOGIES
The article presents data on the evaluation of the study effectiveness of the paper and cardboard by the digital technologies. Information is given about the approximate cost of equipment for quality control of paper and cardboard. The total costs of laboratory equipment for determining the quality parameters of paper and cardboard (forming index, porosity, roughness, thickness, tear resistance, bursting, multilayer strength, compression, morphological characteristics of fibers) are compared with the costs of preparing samples for electron microscopy and processing the images obtained by graphical and analytical programs. In addition to the economic component, the evaluation of the effectiveness of the use of digital technologies is carried out according to time costs and the number of specialists involved in the study.
Keywords: paper, cardboard, recovered paper, digital technologies, quality indicators.

I. V. Porotikova, M. B. Kirillova, D. V. Serbul
DOI: 10.46418/2619-0729_2022_1_15
Improving the accuracy of products made by 3D-printers
The article presents the main stages of constructing a part of a complex shape in the AutoCAD graphics program. The result of 3D-modeling is a file with the extension ".dwg", exported to the ".stl" format for further 3D-printing. The paper presents the characteristics of 3D-printing

(line thickness, extruder temperature, printing speeds, plastic infill, etc.), in accordance with which a complex-shaped part was made. The quality control of the manufactured part made it possible to establish the shrinkage parameters of the plastic for the printing conditions. The high precision of manufacturing the part was achieved by determining the shrinkage coefficient of each part size. Re-manufacturing of the part with amendments made it possible to achieve compliance with the dimensions specified in the drawing and the finished product.
Keywords: detail accuracy, 3D-design, 3D-printer, complex shape detail

N. V. Evdokimov, A. N. Keutaeva
DOI: 10.46418/2619-0729_2022_1_16
EVALUATION OF THE POSSIBILITY OF USING WOOD RAW MATERIAL IN ADDITIVE TECHNOLOGIES
The article is devoted to assessing the possibility of using wood waste as a raw material for various 3D printing technologies. The main types of 3D printing are analyzed, such as: laser sintering of metal powders («SLM» technology), sterolithography («SLA» technology (printing with a liquid polymer or resin)), bioprinting, polymer extrusion («FDM», «FFF» technology); layer-by-layer printing from powder («PolyJet», «Binder Jetting» technology) and et. The characteristics of materials used in additive technologies are considered in detail. Based on the critical analyses of additive technologies recommendations are given on the conditions for the preparation of wood dust for their use in 3D printing.
Keywords: Additive technology, 3D-printer, wood raw material

N. P. Midukov, V. S. Kurov, M. A. Litvinov, M. A. Silbergleith
DOI: 10.46418/2619-0729_2022_1_17
COMPARATIVE EVALUATION OF PAPER MICROSTRUCTURE BY IMAGEJ AND AUTOCAD PROGRAMS
The paper presents the results of a paper study. A sample of the material obtained in the laboratory was analyzed using an electron microscope. The image of a cross-section of paper was processed using programs, ImageJ and AutoCAD. The cut-off areas of the fibrous material obtained in AutoCAD were compared with the area calculation data at various stages of image preparation to estimate the fiber cut-off area in ImageJ. As a result, the adjustment modes of shades of black and white were selected, which allow for fast and high-precision graphical processing of the microstructure of the fibrous material. As a result, the calculated areas in ImageJ and AutoCAD are compared and the error is estimated.
Keywords: paper, paper microstructure, digital processing, paper properties

TECHNOLOGY OF PRODUCTION OF TEXTILE AND LIGHT INDUSTRY PRODUCTS

N. V. Pereborova, A. A. Kozlov
DOI: 10.46418/2619-0729_2022_1_18
MATHEMATICAL MODELING AND PREDICTION OF OPERATIONAL PROCESSES OF ARAMID MATERIALS
Mathematical modeling and forecasting of the operational processes of aramid materials used as rescue equipment in case of fires makes it possible to carry out both a comparative analysis of these materials according to the criteria for operational suitability, and to select these materials that most satisfy the goal - saving people in case of fires.
Keywords: aramid materials, operational processes, mathematical modeling, numerical prediction