DEVELOPING THE DESIGN OF TRITURATE TABLET MACHINE

page 4–8

Producing medicines that meet the requirements of current legislation requires equipment that is designed, operated and repaired under conditions of Good manufacturing practice. For implementing this prerequisite, correct formulation of source data and technical design specification is needed.

Producing solid dosage forms is realized in a typical technological process, where wet granulation and drying of the obtained molding compound is a significant part of production. Creating tablet machine for producing molded (triturate) tablets needs taking into account the specificity of the finished products and improving the technological process at combining several operations.

In this paper, modern concept of technical specification in designing triturate tablet machine and its design, which takes into account achievements in pharmaceutical engineering and provides even distribution of ingredients, sterility and liophilicity are developed.

The design of the developed triturate tablet machine allows significantly change the concept of producing molded tablets and creates modern principles in the wider use of this type of solid forms for technologies of sterile and non-sterile medicines.

Keywords: medicine, triturate tablets, tablet machine, liophilicity, wet granulation.

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DEVELOPMENT AND INTRODUCTION OF NEW METHODS FOR DETERMINING MILL CAPACITY OF BOILER COAL-PULVERIZATION SYSTEM

page 8–11

The paper gives new methods of determining the capacity of air-swept ball mills of a coal-pulverization system of coal power units of 150–200 and 300 MW, proved in production at thermal power plants (TPP).

The main advantage of the methods over the known method, the disadvantage of which is the complexity of operations, manual coal selection from a conveyor belt, comparing it with subsequent calculations, is the ease and efficiency.

Three methods of determining the capacity of air-swept ball mills were considered, namely: for coal-pulverization systems with industrial bunkers and a direct supply of pulverized coal to the furnace; using backup fuel.

The introduction of the new methods at thermal power plants (TPP) with pulverized coal-fired boilers will give a significant economic effect due to the possibility of more effective operation of air-swept ball mills, and thus more efficient fuel combustion in boiler plant furnaces (reducing heat losses with q2 and q4) and increasing the efficiency factor (EF).

Keywords: boiler, ball mill, coal-pulverization system, mill capacity, methods of determining mill capacity.

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ARTIFICIAL FORMATION OF ENERGY ACTIVITY IN THE BIOREACTOR AT THE RESONANCE LEVEL

page 11–14

One of technical solutions for providing heat-mass transfer and aeration in the bioreactor without using mechanical mixing devices is considered. The research topic is disclosing the advantages of ultrasonic irradiation of the case and clarifying the nature of intensifying energy activity of the bioreactor content.

The methodology of the research consists in explaining the conditions for forming the increased energy activity of the reactor working structure using two types of waves — longitudinal and bending. The

mechanism of occurrence of resonance and increased turbulence of the working fluid in the case of wave coincidence is disclosed.

The results of the work lie in describing the conditions for the appearance of, except wave coincidence, two additional caustic surfaces, coaxial to the case and promoting the formation of zones of increased energy activity of the bioreactor content.

The studies are related to the field of biotechnology, in particular, to gaslift bubbling apparatus.

The studies have proved the effectiveness of the method for artificial formation of energy activity of the bioreactor working fluid at the resonance level by two types of waves. The absence of mechanical mixing devices will improve the product sterility and increase the process efficiency and quality.

Keywords: energy activity, wave coincidence, caustic surfaces, limiting frequency.

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FEATURES OF ENSURING THE ACCURACY OF COORDINATED DIMENSIONS WHEN USING TYPICAL FLOW SHEETS

page 14–18

When developing any design it is mandatory to carry out dimensional analysis of all design solutions. The main aspect in this case is primarily calculating output parameters coordinated dimensions of the hole. Two typical flow sheets: cutting tool guiding and non-cutting tool guiding are investigated. Analytical dependences for calculating the accuracy of coordinated dimensions for typical flow sheets are presented in the paper. Dependences for determining the interaxle dimension, dimension from the base, positional variation are proposed. The specific weight of the components of the geometric error in the non-cutting tool-guiding and cutting tool-guiding flow sheets is determined. Calculated values of total processing error using modular machine tooling are defined. Studies have shown that the accuracy of coordinating dimensions and positional variations depends on the total geometric accuracy of machine flow sheet elements and total elastic deformations. This will allow to set the optimum accuracy of processing major parts, defining the output geometric parameters of modular machines and select the desired assembly method.

Keywords: dimension, flow sheet, tool, variation, base, unit, error, tolerance.

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APPLICATION OF MACHINE VISION AND IMAGE PROCESSING METHODS IN PRODUCTION

page 18–23

The paper deals with the analytical review of application spheres of machine vision-based systems and image processing methods. As a result of the analysis, promising ways of broad implementation of machine vision in the production, caused by an increase in the volume of output and its quality are outlined. Basic components of machine vision systems are thoroughly analyzed and classified by a number of features, their role and level of influence on the quality of the resulting image is defined. Five basic image processing methods are considered. Peculiarities of each of them and their inherent advantages and disadvantages are identified. The problems of implementing such systems in production and the issues of their interaction with manufacturing equipment and available software for production management are considered. The relevance of broad implementation of machine vision systems in different areas of production, from quality control of products to reading their barcodes, is caused primarily by excluding the subjectivity of estimating the monitored parameters because of the human factor. Based on the analysis of applying machine vision systems in production, their main advantage (such as performance, possibility of continuously-long operation, repeatability of measurement results, etc.) and disadvantages (need for high-quality lighting, calibration, etc.) are identified.

The analysis data can serve as a basis for determining the conditions of using machine vision systems in particular production conditions.

Keywords: machine vision, image processing system, segmentation, digital morphology, pattern, thinning.

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INFLUENCE OF THE DIFFERENCE BETWEEN THE HEATS: COMPONENT COMPOSITION IN WHEEL STEEL KP-T ON CRACK RESISTANCE

The influence of multifunctional modifiers on the stabilization of chemical composition, globularization of nonmetallic inclusions and reduction of their number, as well as increase of crack resistance and level of mechanical properties of wheel high-strength wear-resistant steel KP-T, was studied in the paper. Comparative histograms of reducing the difference between the maximum and minimum points of nonmetallic inclusions in serial and modified steel KP-T were built. It was proved that increasing the properties and improving the wheel steel structure is possible by using deoxidation, modification, microalloying and refining in the liquid state, as the most advanced method of improving the quality of carbon steel.

As a result of the studies, the influence of multifunctional modifiers on the reduction of chemical elements dispersion between the heat flow and inside of it, increase of stability and mechanical properties of wheel steel KP-T was determined.

Keywords: multifunctional modifiers, stabilization, chemical composition, mechanical properties, globularization, nonmetallic inclusions, crack resistance.

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EXPERIMENTAL STUDIES OF HEAT EXCHANGER BASED ON HEAT TUBES

The currently applied methods of a deep heat recovery in boiler units use recuperative, regenerating, mixing and combined heat exchangers.

The progress analysis of developments in the field of recovery facilities shows that their main disadvantages include high weight-size parameters, low aerodynamic heating characteristics and, as a consequence, high metal input, capital and operating costs.

For reducing weight-size parameters, a heat recovery exchanger based on heat tubes was designed. The heat exchanger peculiarities is geometrical characteristics of the used heat tubes, in particular, inner longitudinal finning, serving as a capillary structure and a small outside diameter of tubes.

As a result of the studies, it was found that the heat transfer surface of the heat exchanger based heat tubes is on the average 4...5 times less than the surface area of a conventional recuperative heat exchanger, under the same heat power.

The obtained experimental data are useful and important for further studies of heat exchangers based on small-diameter heat tubes with inner longitudinal finning. Their implementation will increase thermal aerodynamic, weight-size and performance criteria of the heat exchange facility under the development in various industries.

Keywords: heat tubes, heat recovery exchanger, recuperative heat exchanger, experimental data, heat transfer surface.

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TELEVISION PYROMETRY IMPROVEMENT

The article analyzes the problem of television pyrometry improvement by determination of the range of linearity of the television system luminous-signal characteristics.

The contemporary scientific literature practically does not have any materials on the relevant research methods or their results. It places special emphasis on the importance of the problems, laid down in this article.

If we consider characteristics, that determine accuracy of the temperature measurement in methods of the television bispectral pyrometry, the main characteristics shall be equivalent wavelength, effective to the noise difference of color temperatures and luminous-signal characteristic. Clearly, accuracy of the temperature measurement is affected by a dark signal range of the specific device. First of all, in such a case it is necessary to make experimental studies of performance of the facilities, which are used today or evaluated from the perspective of their use in the bispectral television pyrometry.

We have accumulated a considerable amount of experimental materials in course of the experiments. They concern formation of signals both in the television information-measuring system parameters of zonal melting, and in the television equipment of another destination, particularly, in the television pyrometers that can be used for control over the temperature conditions for pipe rolling technologies, in the television devices for food product quality control, environmental monitoring, in the television microscopy etc.

Keywords: television pyrometry, television information-measuring system, CCD, television camera, measurements, temperature.

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POTENTIAL ASSESSMENT AND TACTICS OF INCREASING ELECTRIC ENERGY EFFICIENCY OF UNDERGROUND IRON-ORE MINING ENTERPRISES

page 34–39

The paper contains the analysis of energy consumption volumes at iron-ore enterprises with the underground mining method. It is shown that the share of electric energy accounts for about 90 % of the total energy consumption. The amount of energy consumed for technological purposes, as well as its production cost has been increasing every year. Herewith, it is necessary to consider the fact that production cost variations of the produced iron ore have no obvious correlation.

The ways of increasing the electric energy efficiency at mining enterprises are considered. Specific recommendations for improving the energy efficiency of the domestic underground iron-ore production are given. First of all, it is proposed assessing current potentials of specific production types that will allow optimizing the process of energy consumption by certain types of consumers. Special attention is paid to considering the peculiarities of mining enterprises.

An integrated solution to improving the energy efficiency of domestic iron-ore enterprises also requires organizational measures, beginning with the introduction of an effective energy management system.

Keywords: electrical supply, iron-ore production, energy efficiency, energy consumption, energy management service, energy-saving policy.

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WATER-CHEMICAL MODE CALCULATION OF NPP BLOCK MULTISTAGE CIRCULATING COOLING SYSTEMS

page 39–43

Method and algorithm for calculating the number of water-chemical modes of complex circulating cooling systems of TPP and NPP are proposed in the paper.

Method for calculating the carbon dioxide balance, allowing to obtain the calculated values of pH and alkalinity forms in circulating water for the studied systems, almost no different from the analytically measured values is improved.

Based on the system laboratory and industrial researches for various water classes, the dependence of the deposition rate on the calcium ion concentration in the circulating water is obtained.

The necessity of development testing of the studied water-chemical modes of complex circulating cooling systems, which can be made on a scale model of the investigated system with the corresponding thermohydraulic characteristics for the specific water composition is shown.

Based on the obtained experimental equation, it is possible to evaluate specific hypothetical values of the mass and thickness of deposits on heat-transfer surfaces of condensers and use this data to predict the operation of existing and newly designed cooling systems of large power facilities.

Keywords: circulating cooling systems, TPP and NPP condensers, deposition rate, water-chemical modes.

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INCREASING THE MOBILITY OF CABINS OF DYNAMIC SIMULATORS OF MOBILE MACHINES

page 44–48

Driving combat mobile machines (MM) is very difficult and dangerous operation, which requires making quick decisions on roadholding and instant reactions on the movement change by manipulating driving devices. Therefore, the problem of increasing the MM crew training quality is very important, and improving the complex of imitating motions of the simulator cabin, bringing them closer to the real conditions of operation and behavior in extreme situations is an urgent issue. Known simulator systems for MM crews either do not create acceleration load, or have limited spatial working area. Using the proposed simulator design, based on the hexapod with mobile two-coordinate basis has allowed to increase the dimensions of spatial working area and the mobility degree, improve maneuverability and ability to implement complex imitating motions of the crew cabin (MM). As a result of the studies, mathematical control models of kinematics parameters of the simulator, imitating the MM movement on water in conditions of pitching and rolling, or by land with the challenging terrain are developed. Levels of the acceleration effect on the MM crew when practicing maneuvers, such as sidewise one-way or two-way skiddings, corresponding to the real operating conditions are determined. The main value of the research results lies in creating control tools and means of motion parameters of cabin of the proposed simulator design, enhancing its mobility and subsequent effectiveness of MM crew training for real extreme conditions.

Keywords: hexapod, dynamic platform, jerk, basis, simulation, maneuver.

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DEVELOPMENT OF ADVERTISING ELECTRONIC EDITION OF «PRINTHOUSE» PUBLISHING OFFICE

page 49–54

As a result of solving theoretical and practical problems, an advertising and information edition of the «PrintHouse» publishing office with a local-network distribution was developed. Its main purpose lies in familiarizing customers with the enterprise provided services and prices. The user can simply download the application onto his/her hard disk (if that is a network distribution) or open the presentation CD.

Upon the development of the EE (electronic edition), it was found that it is updateable, because it contains some data, which require updating at times (service prices). This means that the edition content requires frequent adjustments. Therefore, Web-mailing is the most appropriate way of its distribution. A small information scope of the edition (25 MB) also predetermined the choice of an electronic distribution.

CD formats of the project will be also brought into edition, but serving, however, as special cases of familiarization with actual offers and current prices of the publishing office.

Thus, the developed software can be implemented as the publishing office advertising module, distributed locally and by the network.

Keywords: electronic edition, navigation, software, testing, edition.

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KINETIC ENERGY REDISTRIBUTION ON THE HYDRODYNAMIC INITIAL SECTION

page 54–58

Scientific and technical information, regarding the issues of viscous and abnormally viscous liquid flow in geometrically heterogeneous channels is analyzed. The reasons of additional energy losses, caused by the occurrence of the inertial forces in the flow during the development of the velocity profile on the hydrodynamic initial section of channels are determined. Kinematic characteristics of unstabilized flow under various conditions of entry in the initial section are investigated. The analysis of kinetic energy redistribution in the flow is carried out. The functional dependence of the Coriolis coefficient on hydrodynamic conditions of entry in the initial section is found, and formulas to calculate its length are defined. An opportunity to identify additional pressure losses without using the hydrodynamic section method, associated with restructuring the velocity profile on its length is provided. Calculated dependences to compute the length of the flow stabilization section are defined. The obtained results of «control» over the hydrodynamic conditions of entry allow to create the optimal operating modes and improve performance characteristics of the process equipment.

Keywords: hydrodynamic conditions of entry, kinetic energy redistribution, length of initial section.

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STUDY AND SELECTION OF COIL PARAMETERS FOR NTUU «KPI» MICROSATELLITE

page 58–64

Microsatellite motion relative to the center of mass (rotational motion) is much more sensitive to external perturbations than the motion of the center of mass along the trajectory, which does not notice them at all. That is why angular motion control of the microsatellite, or, in other words, control systems relative to the center of mass, is as a rule the most difficult and crucial part of the onboard equipment. The efficiency of the MS and, consequently, efficiency of practical tasks they perform significantly depends on the functionality of these systems, as well as their technical and operating characteristics. Performance of the «KPI» microsatellite when using the system control unit — magnetic coils for space orientation of microsatellites is defined. For the microsatellite to have the correct orientation, it is necessary to select such parameters to be able to manage the current supply in the coils proportionally to the required rotation in space.

The research data and results obtained are used in designing on board systems of spacecrafts.

Keywords: moment of rotation, magnetic coils, current, magnetic devices, microsatellite.

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