

Panteleenko E. F. Specific Features of Diffusion Alloying and Boride Layer Thickness Determination for Polydisperse Systems of Cast Iron Particles

Specific features of morphology and structure of diffusion borated powders of iron shot waste are studied in the paper. Semi empirical method of determining the thickness of boride layer according to the powder particles size and thus predicting boron content in the powder is also suggested. The method described is based on experimental data for a certain material and preset conditions of chemical-thermal treatment.

Shevchenko A. V. Improving Vibration Resistance for Turning Employing Lathe with Potentially Unstable Cutter-and-Carriage Elastic System

Improving vibration resistance for the process of cutting by the machine-tool with potentially unstable cutter-and-carriage elastic system can be achieved by the use of special tooling with oriented elastic center. The results of theoretical studying the influence of tooling with oriented rigidity onto dynamic characteristics of the cutter-carriage elastic system are presented in the paper.

Senko V. I., Pastuhov I. F., Makeev S. V., Pastuhov M. I. On the Load-Carrying Capacity of Beams Above the Springs of Freight Bogies

The problems of evaluating a stressed-strained state of the beams above the springs of freight car bogies of three generations are considered : the beams having pillars and pillarless with rigid slippers and also pillarless with elastic ones. It is shown that pillarless beams have a high load carrying capacity. Their stresses from static load are by 26 % lower and from dynamic load by 22,5 % lower than those in pillar beams. Operational conditions in pillarless beams are greatly improved by employing elastic slippers in their design and their safety factor for fatigue resistance is increased by 23 %.

Stetsenko V. Y., Rivkin A. I., Gutev A. P., Konovalov R. V. Modifying Silumins with Small-Crystal Aluminum Alloys

A fundamental possibility of modifying the structure of castings made of cast iron, bronzes BrAG9-4 and BrOCS-5-5-5 and brass LC40Sd with structural-fine silumin modifier is determined. In the process of cast iron modification at 1300 °C pearlite castings with vermicular and spheroid graphite were obtained. Modification of bronze BrAG9-4 enabled to obtain inverted microstructure and improve hardness by 21 %. Treatment of bronze BrOCS-5-5-5 with the same modifier increased the dispersity of casting structure twice on the average and improved their hardness by 51 % on the average. In the process of die casting the dispersity of phase components of modified brass LC40Sd castings increased twice, and spoilage connected with gas shrinkage porosity was reduced by 8 % on the average.

Stetsenko V. Y., Rivkin A. I., Gutev A. P., Pevnev A. M. Structural-Fine Dispersed Silumin Modifier for Cast Iron and Copper Alloys

A fundamental possibility of applying aluminum based small-crystal alloys including titanium and antimony as modifiers for main phase components of aluminum-silicon alloy structure is determined. Modifying hypoeutectic silumin AK9 enabled to reduce the size of the primary grain of α – phase by 4 times on the average, and the size of eutectic silicon by 2 times on the average. In modified castings made of AK12 alloy α – phase grain size and eutectic silicon crystal size were reduced to 20–25 mcm and 2–3 mcm respectively. Treating with this modifier the melt of hypereutectic silumin AK 18 enabled to reduce the inclusions of primary silicon by 4 times on the average and aluminum-silicon eutectic by 2 times on the average. In the process of die casting of AK12 alloy the introduction of the modifier enabled to increase the dispersity of α – phase by 4 times on the average, reduce the size of eutectic silicon crystals

by 20 times on the average, reduce spoilage connected with faulty sealing by 14,7 % on the average.

Zlotnikov I. I., Khilo P. A. Express-Method of Evaluating Disjoining Action of Glass Cutting Liquids

A novel express-method of evaluating disjoining action of technological liquids for glass cutting is developed.

The efficiency of disjoining action was evaluated according to the degree of dissolution (transition to stable organosol) of amorphous silicon dioxide in a liquid under study. The dissolution of amorphous silica as well as disjoining action of the liquid during glass cutting is based on the same physical-chemical phenomenon – the occurrence of disjoining pressure due to the tendency of liquid with low surface energy to wet the surface with higher surface energy. During glass cutting the liquid tends to disjoin major crack for further movement, and when used with silica to penetrate between primary particles of 2-3 nm size, which constitute amorphous silica.

The correlation between the degree of solubility of silicon dioxide in a given liquid and the efficiency of its disjoining action is established. The express-method developed was used in the development of new compositions of new technological liquids for glass cutting.

Koupreyev M. P., Leonovich E. N. Developing and Studying Technological Conditions of Manufacturing Grinding Wheels of Borazon on Ceramic Bond

The results of studying the influence of lithium oxide and sodium fluoride on viscosity and durability characteristics of ceramic glassy bond are presented. The composition of fusible ceramic bond and main technological conditions of manufacturing grinding wheels of increased durability of borazon based on this bond are defined.

Popov V. B. Dissipative Losses in Linkage Mechanisms of Mobile Power Units

The methods of determining and reducing mechanical losses in linkage points of linkage mechanism UES-2-250A during displacing a mounted device by three-point lifting device of multipurpose power unit «Poliesie» into transport position are proposed. According to the results of studying two-dimension analog of mono travel linkage mechanism analytical expressions for power analysis of the linkage mounting mechanism are obtained. Following this the computation of response in linkage points of the linkage mechanism was conducted, and also of respective friction forces and the efficiency in the process of displacing mounted unit from operating to transport position. Optimization mathematical model was formed enabling to reduce losses in linkage mechanism by 6–7 %. The algorithm of increasing load carrying capacity enables to increase load carrying capacity of three point lifting device UES-2-250A and can be used for increasing load carrying capacity of wheel tractor «Belarus 2522».

Kourganov V. V., Kryshnev Y. V., Kapturov O. P. Improving Accuracy of Controlling Synchronous Motors Self-Starting with Digital Relay Sepam 2000

The problems of improving the accuracy of synchronous motors self-start with field deceleration by the function of resynchronization, programmed in digital relay Sepam 2000 «Schneider Elektrik» are considered in the paper.

The fact of power failure of synchronous motors according to algorithm of resynchronization is determined by the decrease of voltage frequency and reverse active power in the synchronous motor. However the operation experience of such relay in RUP «Gomeltransneft Drouzhba» demonstrated that at power failure and simultaneous run-out of synchronous and asynchronous motors resynchronization function failure often occurs.

Experimental studies and transients simulating conducted in this work enabled to find out the cause of failure of measuring device of reverse active power ($ИО_p$) due to oscillatory proc-

ess of active power transfer of synchronous and asynchronous motors at their simultaneous run-out.

The variants of improving resynchronization function algorithm are presented one of which includes applying measuring device for the direction of total power ΠO_s , and the other includes changing logic part of the relay.

Krotenok V. V. Developing the Unit for Profound Overvoltage Limiting in Electric Network

A review of existing methods and circuits for protecting distribution networks for 6–10 kV from internal overvoltages has been performed. A number of advantages and disadvantages of currently available internal overvoltage protection circuits are determined.

A schematic design of the unit for profound overvoltage limiting in electric network is proposed. A number of experiments are conducted for determining the advantages of the unit and validity of the unit simulation data. The results of investigating transient processes in the distribution network with the employment of the unit for profound overvoltage limiting are presented.

Pohulayev M. N. Comparative Analysis of Present-Day Electromechanical Converters and Prospects for their Application in High Frequency Self-Contained Electro Hydraulic Vibrators

The system of criteria of evaluating the speed of response of electromechanical converters of electro hydraulic vibrators is presented, a comparative analysis of the speed of response of present day electromechanical converters is conducted and the prospects for their application for designing high frequency self-contained electro hydraulic vibrators with maximum operating frequency twice or more times higher than currently available are evaluated. Main lines of further work for obtaining required speed of response of electromechanical converters are specified.

Yevminov L. I., Gouminskii A. N. Transformer Operation Mode Control Device

The possibility of controlling the operation mode of power transformers with the aim of electric energy saving using microprocessor units is considered. The device for controlling the transformer operation mode on two-transformer substation is proposed based on employing microprocessor protection unit MP700 RUP «Belelectromontagenaladka», adjustment of current and voltage circuits to the unit is conducted, the algorithm of the device operation is built and configuration of the internal logic of MP700 unit is checked by the algorithm built.

Putyato A. V. Computer Simulating Hydrodynamic Stress Loading of Car Tank Man-Hole Area

Finite element model of median longitudinal plane of a boiler with liquid is developed in ANSYS software allowing for the man-hole with its shell and enabling to make computation of the values of liquid pressures on metal structure of the body taking into account the possibility of partial boiler filling simulating, the properties of liquid load transported and kinematic parameters of a car movement.

Time relations for liquid pressure on internal surface of the boiler for different levels of boiler filling with liquid load are obtained. The study of the computation results when filling the car tank to over 80 % demonstrated that maximum pressure values in the area of boiler shell and man hole joining greatly exceed test pressure and at standard filling the excess is reported for every area.

The study of stress loading of a unit at the change of the height of the part of the man hole shell located in the boiler is conducted. Efficient values of the above parameter for different filling levels of the boiler are defined with regard to minimum hydrodynamic stress loading during car collision.

Asenchik O. D., Murashko V. S. The Models for the Interaction of the Objects Having Internal States with a Group of Service Agents

Mathematical models for the system of the objects having three different internal states are presented in the paper, interacting by agents' interchange. When the agent is «captured» or «released» the objects would change internal states. The models proposed feature different calculation complexity. Two of them represent linear models based on Kolmogorov equations for the probabilities of different states of a system. The third model describes the system with regard to self-consistent interaction of a totality of the objects with the «field» of agents.