Power Engineering

Improved volumetric (three dimensional) mathematical model of the cooling cylinder (compartment) turbines. It is implemented as a combination of continuous analytic and finite-difference solutions. At the same analytical expressions obtained with allowance for the thermal interaction of all bodies that make up the cylinder (rotor housings, clips, diaphragms, etc.) describe the heat balance in the radial direction, and finite difference - in the district and.

Calculation results for no equilibrium wet steam flow in axisymmetric expanding nozzle. Condensation instability for pure spontaneous condensation (without heterogeneous nucleus) may be observed. Stabilizing influence of growing heterogeneous nucleus concentration on the flow, which caused the change of regime into the stable flow with the rise of pressure, is shown.

Dynamics and Strength of Machines

The technique of definition a damage a material of a rotor of a high pressure of turbine T-250/300-240 in the conditions of low-cycle fatigue and creep offered for an operative estimation of operation of a resource. Data about actual modes loading a rotor (are defined on parametres of MANAGEMENT information system TP of a turbine unit) and experimental characteristics of low-cycle fatigue and creep of metal are used.

The new method of determination of resonance (own) frequencies of the oscillating systems is offered. This method allows to determine resonance frequencies for the oscillating systems with any number of degrees of freedom. In this method numeral decisions are not used it is analytically exact.

The investigations of residual stresses generated inthe surface layers of specimens made of titanium alloys, which were subjected to annealing, processed by vibropolishing andstrengthen with varying intensity balls using the ultrasonic unit are carried out. The regular occurrences of surface hardening by BT 8 alloy cold working in connection with the stability of residual stresses are established

Applied Mathematics

A scheme of three-dimensional spiral-helix spiral tubular solar collector has been represented, and principle of its operation has been described. Analytical expressions for the length of the helix on the surface of the hemisphere and the length of the plane Archimedean spiral at the base of the hemisphere have been found. These dependencies can be used in design, manufacture and operation of solar collectors, as well as for calculation of solar energy flux perceived with them, as a function of spatial coordinates and time.

Cubature formulas of the calculation of Fourier's coefficients of two variables are considered by using operators of piecewise spline-interlineation in the case when information about function is set of lines, set of knots on one class of differentiable functions. The estimations of error of approaching of the cubature formulas are presented.

Non-traditional Power Engineering

The application of the recently discovered low-temperature thermoelectric material CsBi4Te6 in thermoelectric generators (TEG) for automotive cryogenic power systems is proposed. The maximum energy conversion efficiency of a considered TEG assembly within a cryogenic storage tank is estimated to be about 15%. To determine specific power, heat flow through the TEG was calculated using a one-dimensional thermal model. It has been obtained that low-temperature TEGs are applicable for additional power generation in cryogenic power systems, and these generators can sufficiently increase total energy efficiency.

Obtained experimentally by the dependence of pressure in the gas tank when it is heated. It is shown that the deviation of the theoretical values obtained previously, an average of 6%.

High Technology in Mechanical Engineering

In work results of research of influence of activation on technological and ecological characteristics of an arch are resulted at welding in inert gases. It is shown that it promotes reduction of allocation of harmful substances, raising it ecological cleanliness of welding tungsten and mtal electrodes. Activation improves also technical characteristics on an arch, increasing in 2÷4 times depth of profusion at simultaneous increase of mechanical properties of metal of welded connections.

Mechnik V. A. Estimation of influence of interaction of carbon with compound of carbides, borides, nitrides, silicides on structure and properties of composites Diamond-Fe-Cu-Ni-Sn 65

In the elasticity theory framework, the expression has been derived for the energy required for joining the carbon atom in the crystal lattice of carbides, borides, nitrides, silicides of transition metals Ti, V, Cr Mo, Nb, Hf, Cr, W and Zr, silicon compounds and boron, in order to assess their contribution to the structure and properties of diamond-containing composite material (DCM) Fe-Cu-Ni-Sn. It is found that adding CrB2 to the initial composition Diamond − 51% Fe-32% Cu-9% Ni-8% Sn, in contrast to other additives of refractory compounds, provides a complete decarbonization in the diamond-matrix transition zone by formation of the Cr3C2, Cr7C3 and Fe3C nanoscale (5−40 nm) thickness layers and significant increase in wear resistance of DCM. By combining the obtained formulas with the methods of the physical material science, the parameters and p-T-t conditions of final squeezing of the diamond-containing composite that provide the higher physical and mechanical properties of DCM as compared with the industrial technologies.