

Power Engineering

- Shubenko A. L., Kovalsky A. E., Vorobyov U. S., Kartmazov G. N. and Romanenko V. N.** Influence of erosion on main operation features of the last stage movable blade of a low-pressure cylinder of a powerful steam turbine. Part 2. Prediction of vibration features of a movable blade of the last stage that change as a result of erosive wear and choosing a method of its passive protection from erosion.3

A problem of providing erosive resistance of movable blades of the last stage of power steam turbines when applying anti-erosive protective coat using method of atomic-ionic dispersion of materials has been considered. The problem can be solved with the help of the worked out universal mathematical model of drop impact erosion. The choice of parameters of the protective coat for the movable blades of the last stage has been grounded. Results of the comparison of the received theoretical and experimental data have been shown.

- Lynnyk O. V. and Khaitov V. D.** Up-to-date level and main trends in development of hydraulic turbine construction in Ukraine.11

The technical level of domestic hydraulic turbines is shown. The accumulated experience and role of the OJSC "Turboatom" in creation and manufacture of turbine equipment are illustrated, the structural features of hydraulic turbines are considered. The state of research works and experimental base of branch and OJSC "Turboatom" were analyzed.

Aero- and Hydromechanics in Power Machines

- Yershov S. V. and Swirydczuk J.**, Analysing secondary vortex structures in an hp turbine stage using the realisable $k-\omega$ SST model.19

The article analyses the effect of turbulence model selection on the pattern of development and interaction of secondary vortex structures in an HP turbine stage. The basic tool used in the analysis is FlowER, a specialised code developed for studying flow through fluid-flow machine stages and stage sections. The flow calculations performed using a standard $k-\omega$ SST turbulence model presented highly unstable behaviour of the rotor passage vortex, which periodically built up, moved up along rotor blade suction side and broke down. On the other hand, the use of the modified version, taking into account realisability constraints, has made it possible to stabilise the rotor passage vortex behaviour.

- Solodov V. G., Subbotin V. G., Levchenko E. V., Shvetsov V. L., Konev V. A. and Alpert A. C.** Aerodynamical improvement of design, aerodynamic and power characteristics of "I.P.-L.P.-1" compartment of steam turbine K-325-23,5.27

The modernization of the outlet I.P. compartment of steam turbine K-325-23,5 is made on the numerical analysis of aerodynamic and power characteristics. The compartment includes the channels of jointed I.P. and L.P. stages, extraction chamber and fragments of receivers. Among the objects to be modernized are I.P. and L.P. stages, the extraction chamber and elements of flow organization in the extraction chamber. The effect of elements of flow path is discussed on the flow pattern and on the aerodynamic and power characteristics of compartment.

- Soukhorebry P. M., Koval S. O., NENYA V. G., Kochevsky O. M.** Determination of structure of flow in a spiral case of the radial-axial reversible hydromashine on basis of numerical research of flow.31

The paper presents the results of numerical research of three-dimensional viscous fluid flow in the spiral casing of a reversible hydraulic machine performed using the Reynolds averaged Navier-Stokes equations and $k-\epsilon$ turbulent model implemented in the software tool FlowVision. A two spiral casings, expected on laws $Vu \cdot r = \text{const}$ and $Vu = \text{const}$, execute calculations. The analysis of structure of fluid and feature of flow is executed in two spiral casings.

Heat Transfer in Engineering Constructions

Matzevity Yu. M., Chirkin N. B. and Kuznetsov M. A. Thermo-economic analysis of the heat-pumping system of the heat supply 42

The thermo-economic model of the monovalent heat-pumping system of the heat supply of autonomous object is developed. The analysis of model made it possible to obtain the analytical solution, on the basis which are determined the optimum conditions of the design of the system of heat supply in question and the regimes of its operation. The solution is useful for any steam-compression heat-pumping installation, which works according to the diagram proposed.

Dynamics and Strength of Machines

Martynenko G. Yu. Estimation of radial and axial forces dependences from displacements of the rotor magnet in the radial magnetic bearing with two circular permanent magnets 52

The construction of the magnetic suspension of rotors with two permanent circular magnets is considered. It is described the method and results of the numeral determination of magnetic forces dependences from a rotor displacement at radial and axial directions. Their correlation is detected. There are presented the results in the form of three-dimensional graphs.

Applied Mathematics

Usov A. V. and Batyrev A. A. Mathematical modeling of verifying the coatings of construction units on the base of singular integral equations 65

The article is dedicated to the application of singular integral equations to the solving a number of technological problems. The mathematical model is developed. It allows verifying the state of hereditary defects of type of detachment at the boundary between main materials and coatings, which are appeared during application, evolution of these defects to the surface cracks and chips under the influence of thermomechanical effects during machining, and the conditions of conservation of balance of mentioned defects.

Optimization Problems in Mechanical Engineering

Ilchenko B. S., Prishchepo A. A., Ivasyutyak I. S., Prishchepo I. A. and Inkulis V. V. Research of natural gas balance error in main gas pipelines system 76

The task of natural gas balance error adequate mathematical description for the main gas pipelines system is examined. The task raising and requirement to its decision in the conditions of information incompleteness and heterogeneity about the error sources and inaccuracy of basic data are formulated. Solution as the combined mathematical gas balance error model as a synthesis of analytical and numeral statistical model is offered.

Non-traditional Power Engineering

Kostiuk V. Ye., Kanilo P. M., Solovey V. V. and Kostenko K. V. Numerical modeling of oxyhydrogen thermochemical preparation of low-grade coal 80

Problem of combustion stabilization of low-grade coal without usage of natural gas or mazut has been considered. It has been appraised with the help of calculating aerohydrodynamics methods, thermochemical preparation efficiency of high-ash coal during its heating by combustion materials of natural gas and hydrogen in oxygen-enriched air. Calculation results of multi-stage powdered-coal burner with air spin and different variants of reactor powering of thermochemical preparation with reagents have been cited. Efficiency of substitution of natural gas for hydrogen and oxygen during firing high-ash coal in boilers of power units has been proved.