

PERFORMANCE ANALYSIS OF SEALING DEVICE IN GAS TURBINE ENGINE

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ABSTRACT

Gas flow parameters and stability conditions of non-contact gas seals are considered. The leakage characteristics for three non-contact gas seals (annular, labyrinth and helical) are obtained by numerical simulation for different pressure drops and shaft rotational speeds. Rotordynamic-coefficients (the direct and cross-coupled stiffness and damping coefficients) are calculated on the basis of the three-dimensional numerical modeling methods for gas seals. Results for small values of rotor eccentricities ($e < 0.2$) are compared with experimental data by Nelson and Childs. Gas flow computations in case of circular precession with large eccentricities ($e \approx 0.8$) are presented. It is shown that rotordynamic-coefficients nonlinearly depend on rotor displacement.

The methodology for analysis of aeroelastic vibrations of gas seal elements under the action of gas-dynamic forces is developed. The models with different vibration modes depending on operating and seals structure parameters are represented.

Keywords: gas seal, leakage, rotordynamic coefficients, aeroelasticity and vibration of seal elements.