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# SERVICE LIFE OF GAS TURBINE COMPRESSOR UNDER HIGH FREQUENCY VIBRATIONS OF BLADES[1]

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The work deals with the problem of assessing the durability of the compressor disk in high-frequency cyclic loading, regarding the observed torsional vibrations of the blades. The numerical-analytical method is proposed in order to calculate the three-dimensional stress-strain state of elastic disks of variable thickness under the action of cyclic loads due to the torsional vibration of blades. Based on Fourier series approximate representation of solutions is used to describe its dependence on the coordinates along the thickness of the disk and in the circumferential direction. The Fourier coefficients in the formulas of this representation depend on the radial coordinate regarding the system of ordinary differential equations. Boundary value problems for this system of ODE are solved using an implicit finite-difference scheme. The effect of torsional vibrations of the blades is simulated by periodic shear stresses applied on the outer contour of the disk.

For low-cycle fatigue regime (flight cycles) the stress-strain state (SSS) and the fatigue life of a rotating disk of variable thickness are already calculated in [1] taking into account the action of centrifugal and aerodynamic loads on the disk and blades.

Calculated SSS due to vibrations is imposed on SSS in flight cycles and used to estimate the durability of operation and identify areas of damage origine in considered discs. For this purpose, the known criteria for multiaxial Low-Cycle Fatigue mode (N <105) [2] are generalized on the mode of Very-High Cycle Fatigue (N> 108), where N is the number of cycles before destruction. It is shown that the actual time of the safe operation for both LCF and VHCF modes have similar values.

## References

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