

EFFECT OF BEARING CLEARANCE ON THE STABILITY OF CYLINDRICAL JOURNAL BEARING

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ABSTRACT

Cylindrical journal bearings are widely applied in different rotating machinery. These bearings allow for the transmission of large loads at the mean speeds of rotation. In some cases the rotating machine equipped in these bearings can operate at high speed as, e.g., 20,000 rpm. In such case the problem of stability is of great importance and should be investigated theoretically and experimentally. One of the important parameters affecting the stability is the bearing clearance.

The stability of bearing can be investigated theoretically based on the dynamic characteristics of bearing. These characteristics are determined by four stiffness and four damping coefficients. The grounds for calculation of these coefficients are the oil film pressure and temperature distributions.

Experimental procedure allowing the checking of bearing and rotor stability includes the rotor rotating at the high speed. The test rig, with symmetrically supported rotor, has allowed for the maximum rotational speed of 30000 rpm at the weight of mass 0,3 kG. It was stated that there is different effect of bearing clearance for different unit loads of bearing. In case of large unit pressures of bearing, an increase in bearing clearance moves the stability threshold in the direction of higher rotational speeds and it was observed particularly in the range of small bearing clearances.

The paper describes theoretical and experimental investigation of the effect of bearing clearance on the stability of cylindrical journal bearing. Different values of bearing length to diameter ratio, rotor speed and bearing clearance have been assumed. Reynolds, energy and viscosity equations have been solved for the oil film pressure and temperature distributions. Laminar, adiabatic oil film has been assumed in theoretical calculations.