

DYNAMIC CHARACTERISTICS OF TILTING 5-PAD JOURNAL BEARING AT TURBULENT OIL FILM

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ABSTRACT

The trends towards higher speed for increased performance of turbomachinery has aroused much interest in the subject of bearing influenced rotor dynamics. A major contribution to this was the development of the variable geometry tilting pad journal bearing. The dynamic characteristics, which are determined by the stiffness and damping coefficients, of the bearing are of concern to bearing designers and users of turbomachinery, since stability limits of the bearing could be approached, and the bearing or the bearing system can undergo failure.

The journal bearing systems of high speed rotating machinery can be designed as the systems with the radial tilted-pad journal bearings. In these bearing systems where the journal peripheral speed reaches 220 m/s the determination of both static and dynamic characteristics of system rotor-bearings, critical speeds, response of system on the dynamic load as well as stability of rotor are very important. The static and, e.g. adiabatic laminar or turbulent one.

The literature contains a vast amount of information on the design, modelling, and dynamic performance of tilting pad journal bearings. Many application guidelines and computer programs have been developed and are generally available to aid design selection and evaluation. In more recent years, new developments in tilting pad journal bearing technology have further broadened their application range and the possibilities to determine the dynamic characteristics.

The paper introduces the results of theoretical investigation of the dynamic characteristics of tilting 5-pad journal bearing operating at turbulent oil film. The Reynolds', energy, viscosity and geometry equations giving the oil film pressure and temperature distributions that are the grounds for the dynamic characteristics of bearing, were solved simultaneously on the assumption of adiabatic turbulent oil flow in the bearing gap.