

EFFECT OF DESIGN PARAMETERS ON THE DYNAMIC CHARACTERISTICS OF TILTING-PAD JOURNAL BEARINGS

S. Strzelecki , H. Kapusta
Lodz University of Technology
Institute of Machine Design
Lodz, Poland

ABSTRACT

The rotor operating in the tilting- pad journal bearing can rotate at the peripheral speed 220 m/s. At such high velocities the knowledge of the effects of bearing geometric parameters as bearing length to diameter ratio, bearing clearance, pad relative clearance, pad offset on the dynamic characteristics of bearing is very important.

Stability of rotor-bearing system can be determined based on the calculated dynamic characteristics of bearing that are expressed by four stiffness and damping coefficients. These coefficients allow for calculation of critical speeds, response of system on the dynamic load as well as stability of rotor.

There is a large amount of literature containing the information on the design, modelling, and dynamic characteristics of tilting pad journal bearings. Considering the modification of bearings, e.g., leading groove edge design, more information on the effect of bearing geometric parameters should be given.

The paper describes the results of theoretical calculation of stiffness and damping coefficients of tilting 5-pad journal bearing that have been obtained at different geometric parameters of the bearing including the leading edge groove design.

These calculations have been carried-out at the considered value of supplied oil temperature.

The solution of Reynolds', energy, viscosity and geometry equations has been given the oil film pressure and temperature distributions, that allowed for calculation of stiffness and damping coefficients of oil film. Adiabatic laminar oil flow in the bearing gap, different values of bearing length to diameter ratio, pad relative clearance and pad offset were assumed.