Analysis of Externally Pressurized Fluid-Film Bearings for High-Speed Rotating Machinery

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ABSTRACT

The externally pressurized fluid-film bearing has a wide application in engineering. However, it is still a concern for researchers to apply it to high-speed rotating machinery. This paper presents results from a new, recently developed theoretical analysis for design of this kind of bearing to support high-speed rotor systems. A computer program has been developed to calculate the performances of both hydrostatic-operating and hybrid-operating bearings. The results of the research indicate that a hydrostatic-operating bearing such as the hydrostatic squeeze film damper has a good dynamic characteristic because of its linear stiffness and damping and almost zero cross-coupling terms. As for the hybrid-operating bearing, the hydrostatic effect, if dominating over hydrodynamic effect, can play its positive role in small eccentricity range. However, under the conditions of higher eccentricity, the dynamic feature of the hybrid-operating bearing is shown to be less stable. This paper discusses the cause and some of methods to improve the design.

Keywords: bearing, hybrid, hydrostatic, stiffness, damping