Active Controlled Fluid Film Based on Wave Bearing Technology

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ABSTRACT

It is known since 1992 that the steady state and dynamic performance, including the stability of a wave bearing, are highly dependent on the wave amplitude. A wave-bearing profile can be readily obtained by elastically distorting the stationary bearing sleeve surface. The force that distorts the elastic sleeve surface could be an applied force or pressure. The magnitude and response of the distorting force would be defined by the relation between the bearing surface stiffness and the bearing pressure, or load, in a feedback loop controller. Using such devices as piezoelectric or other electromechanical elements, the bearing could be step-controlled or fully controlled. The selection between these systems depends on the manner in which the distortion forces are applied, the running speed, and the reaction time of the feedback loop.

Using these techniques, both liquid (oil) or gas (air) lubricated wave bearings could be controlled. Some examples of the bearing performance dependency to the wave amplitude are included in the paper. The analysis was also proven experimentally.

Keywords: Wave Bearing, Gas Bearing, Active Control, Fluid Film, Rotordynamics