

Inclined Slider Bearing with Magnetic Rheological fluid under the Effects of Second Order Rotation

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Abstract

A slider bearing consisting of connected surfaces with magneto hydro dynamic fluid as lubricant is analyzed in the present study. A MR-model has been used as a non-Newtonian fluid in a slider bearing. A mathematical model of magneto hydro dynamic fluid flow in a slider bearing is conferred. An extended generalized Reynolds equation of motion for second order Rotatory theory of hydrodynamic lubrication is used for this study. Under the assumptions of the order of magnitudes of the variables, it can be seen only the viscous and non-Newtonian terms have effects, whereas the inertia terms are negligible. The pressure distribution in the bearing is calculated by neglecting higher order terms. The pressure is employed to analyze the bearing load carrying capacity. The results are conferred through table and graphs.

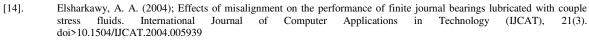
A generalized two dimensional Reynolds-type equation is derived using the equations of motion. The equation is solved to get the dimensionless pressure. The pressure is used to evaluate the bearing characteristics such as load carrying capacity. The results are presented graphically. The film pressure varies with density and viscosity hence it increases with the intensity of magnetic field. Thus the load carrying capacity of the bearing is enhanced by the application of the magnetic field. In presence of magnetic field there is increase in ratio α , β that leads to increased pressure as well as load carrying capacity in the bearing.

The differential equation is solved to induce the dimensionless pressure. The film pressure varies with Hartmann number, density and viscosity thus it will increase with the intensity of magnetic force. Therefore the load carrying capacity of the bearing is increased by the appliance of the magnetic force. In presence of magnetic force there's increase in aspects ratio α , β that results in increasing the pressure in addition as load carrying capacity within the bearing.

Keywords: Continuity, Density, Film thickness, Reynolds equation, Rotation number, Taylor's number, Viscosity.

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