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Investigation of Temperature Effects for a Finite Elasto-Hydrodynamic Journal bearing Lubricated by Ferro Fluids with Couple Stresses

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Abstract

The performance of finite elasto-hydrodynamic journal bearings lubricated by ferrofluids with couple stresses has been studied. We derive the energy equation that takes into account magneto elasto-hydrodynamics. The energy equation obtained is solved numerically by the finite difference technique since it is highly non-linear. The numerical scheme used is implemented in MATLAB so as to obtain the approximate solutions. The temperature distributions are obtained and the solutions obtained represented in graphs. It is clear from the results that the temperature increases with the increase in magnetism and the couple stress. The prandtl number, Erkert number and the bearing length increase the bearing temperature. The results can be used to improve the bearing performance in the engineering field.

Keywords: Couple stresses, Elasto-hydrodynamic, Journal bearing, Temperature distributions

1 Introduction

A bearing is a system of machine elements whose function is to support an applied load by reducing friction between the relatively moving surfaces. Journal bearing is subset of bearings used to support rotating shafts that use the principle of hydrodynamic lubrication. The journal bearing is made up of four main parts as in the Fig 1. This type of bearings is one of the most common forms and is used in a wide variety of machines. When

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