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Non-Newtonian effects on porous elastic journal bearings

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Abstract

This work investigates numerically couple stresses influence on finite porous elastic journal bearings performance. Using the micro-continuum theory of Stokes, the Reynolds equation, considering bearing elastic deformation and Beaver-Joseph velocity conditions at the film-porous interface, is derived. The porous flow is modeled using Darcy's law. The resulting equations are sequentially resolved by fixed-point iteration method. The numerical results of this work demonstrated particularly that couple stresses increase load capacity and decrease friction factor, while the bearing permeability and deformation result in the reverse trends.

Keywords: Non-Newtonian lubricants; Finite journal bearings;
Beavers-Joseph velocity condions; Porous elastic bearings.

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