Accepted Manuscript

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Anas Sakim, Mohamed Nabhani, Mohamed E.L. Khlifi

PII: S0301-679X(17)30576-5

DOI: 10.1016/j.triboint.2017.12.018

Reference: JTRI 5002

To appear in: *Tribology International*

Received Date: 6 October 2017

Revised Date: 27 November 2017

Accepted Date: 13 December 2017

Please cite this article as: Sakim A, Nabhani M, Khlifi MEL, Non-Newtonian effects on porous elastic journal bearings, *Tribology International* (2018), doi: 10.1016/j.triboint.2017.12.018.

Non-Newtonian effects on porous elastic journal bearings

Anas SAKIM[†], Mohamed NABHANI, Mohamed EL KHLIFI

University Hassan II of Casablanca, Faculty of Sciences and Techniques
P.O. Box 146, 20650 Mohammedia, Morocco

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.

[†] E-mail address for correspondence: sakim.anas@gmail.com
Phone number: +212 6 61 56 91 39
Present address: Faculty of Sciences and Techniques
PO Box 146, 20650 Mohammedia, Morocco.