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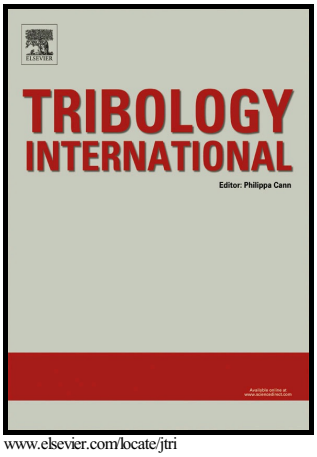

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PII: S0301-679X(17)30008-7
DOI: http://dx.doi.org/10.1016/j.triboint.2017.01.008
Reference: JTRI4548

To appear in: *Tribiology International*

Received date: 23 September 2016
Revised date: 28 November 2016
Accepted date: 8 January 2017

Cite this article as: Fangrui Lv, Zhushi Rao, Na Ta and Chunxiao Jiao, Mixed lubrication analysis of thin polymer film overplayed metallic marine stern bearing considering wall slip and journal misalignment, *Tribiology International* http://dx.doi.org/10.1016/j.triboint.2017.01.008

Mixed-lubrication analysis of thin polymer film overplayed metallic marine stern bearing considering wall slip and journal misalignment

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Abstract

To study the tribological properties of thin polymer film overplayed metallic stern bearings, in this paper a mixed-lubrication model considering two-dimensional wall slip and journal misalignment is developed. Based on the average flow model proposed by Patir and Cheng, an extended average Reynolds equation considering circumferential and axial slip is derived in terms of interfacial limiting shear stress model. The calculation procedure is established by using finite difference method and over-relaxation iterative method. The results show that both wall slip and journal misalignment reduce the minimum nominal film thickness, increase friction coefficient of bearing in mixed-lubrication regime, and raise journal's speed at which transition from mixed-lubrication to hydrodynamic lubrication occurs.

Keywords

Mixed-lubrication; Wall slip; Stern bearing; Journal misalignment

Nomenclature

x	circumferential coordinate
y	radial coordinate
z	axial coordinate
L	bearing width
c	bearing's radial clearance;
D	bearing diameter
r	journal radius
Ω	journal angular velocity
ψ	clearance ratio
γ	misalignment angle
ε_0	eccentricity ratio at the axial middle section
θ_0	attitude angle at the axial middle section
ε_z	eccentricity ratio at every axial section;
θ_z	attitude angle at every axial section
φ	bearing circumferential angle bearing
h	nominal film thickness
h_T	local film thickness