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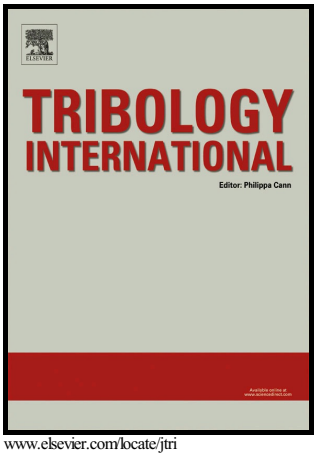
Changlin Li, Jianjun Du, Yingxue Yao



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Changlin Li, Jianjun Du*, Yingxue Yao

Shenzhen Graduate School, Harbin Institute of Technology, Shenzhen 518055, China

HITChina_lcl@outlook.com

*jjdu@hit.edu.cn,

yxyao@hit.edu.cn

Abstract

In this paper, a novel foil thrust bearing is investigated, in which the top foil is supported by overlapped multi-layer flat foils. Contact mechanics and finite element method (FEM) are adopted to model the coordinated deformations of foil layers. The consistence of node-node and node-element contact models is verified, thus simplifying the structural grid meshing procedure. The effects of foil structural parameters on aeroelastic characteristics and bearing load performance are studied. The results show that the plate element is the main supporting component. Increasing the plate thickness and vertex angle of support element can improve the supporting stiffness. Increasing anvil thickness will flatten the distributions of gas film thickness and top foil deflection in bearing plane section.

Keywords: multi-layer foil thrust bearing; contact mechanics; aeroelastic characteristics; load carrying performance

NOMENCLATURE

R_{ti}, R_{to} inner and outer radius of top foil (m)

R_{ai}, R_{ao} inner and outer radius of anvil element (m)

θ_0 circumferential angle of anvil element(°)