Combined Effect of Viscosity Variation and Porous Wall on Squeeze Film Conical Bearing Operating with Rabinowitsch Fluid Model

KEYWORDS

Conical bearing, porous, Rabinowitsch model, squeeze film, non-Newtonian fluid

AUTHORS AND INSTITUTIONS

Amit Kumar Rahul

Department of Applied Mathematics, Indian Institute of Technology (ISM) Dhanbad, India

Pentyala Srinivasa Rao

Department of Applied Mathematics, Indian Institute of Technology (ISM) Dhanbad, India

INTRODUCTION

In this study, the effect of viscosity variation of non-Newtonian lubrication on squeeze film characteristics with porous and Rabinowitsch fluid for conical bearings is analyzed. The modified Reynolds equation representing the characteristics of non-Newtonian fluid with viscosity variation on the porous wall followed by the cubic stress law condition is invoked. For lubricant flow in a bearing clearance and in a porous layer Morgan–Cameron approximation is considered. A small perturbation technique is used to compute the pressure generation using modified Reynolds equation of lubrication. Approximate analytical solutions have been obtained for the squeeze film pressure, load-carrying capacity, squeeze film time, and center of pressure. The outcomes are displayed in diagrams and tables, which show that the effect of viscosity variation and porous wall on the squeeze film lubrication of conical bearings decreases film pressure, load-carrying capacity, and response time for the Newtonian case in comparison to the non-Newtonian case.

REFERENCES

[1] Hsu CH, Lin JR, Mou LJ, 2014, “Squeeze film characteristics of conical bearings operating with nonNewtonian lubricants–Rabinowitsch fluid model,” Ind. Lubr. Trib., 66, pp. 373–378.

[2] Singh UP. 2013, “Application of Rabinowitsch fluid model to pivoted curved slider bearings,” Arch. Mech. Eng. 60, pp. 247–267.