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Comparative analysis of Kozeny Carmon based grounded short bearing with the inclusion of viscosity variation and deformable roughness

Abstract:

The study investigates the effects of elastic deformation in a porous, rough, short bearing lubricated by a ferrofluid, incorporating viscosity variation. It employs Rosensweig's viscosity expression to evaluate how changes in viscosity impact the system and uses the Neuringer-Rosensweig model (NRM) to describe magnetic fluid flow. An averaged stochastic modified Reynolds equation has been developed to determine pressure distribution based on parameters such as elastic deformation, viscosity variation, porosity, and aspect ratio, followed by load calculation. The analysis of Load Carrying Capacity (LCC) is presented graphically, considering different bearing parameters. The findings suggest that increasing magnetization and viscosity variation can enhance the LCC if the aspect ratio is appropriately selected. Conversely, LCC decreases with higher elastic deformation, roughness, and porosity. The combined effects of porosity, transverse roughness, and deformation further reduce load-bearing capacity. However, viscosity variation can partially mitigate these reductions, especially when deformation is minimal.

Biography

Rakesh Manilal Patel is a distinguished academician and researcher in the field of Mathematics, currently serving in the Department of Mathematics, Gujarat Arts & Science College, Ellis Bridge, Ahmedabad, Gujarat, India. With a strong commitment to teaching, research, and scholarly excellence, Dr. Patel has contributed significantly to mathematical sciences through his academic work, publications, and mentorship of students. His areas of interest encompass various branches of pure and applied mathematics, and he actively engages in promoting mathematical education and innovation at both undergraduate and postgraduate levels.