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Abstract

This study has attempted to scrutinize the bearing performance of a rough bearings assisted by Ferrofluid with the help of numerical modelling of Shliomis model as well as Neuringer and Rosensweig. The transverse and longitudinal roughness is calculated stochastically by averaging the Christensen and Tonder model. A non-zero mean is assumed for the probability density function for the random variable that determines the roughness of the bearing which is symmetrical. One of the equations that can aid the calculation of dependent permeability which is influenced by factors like pore shape, porosity, tortuosity and specific surface is Kozeny-Carman's model. The Beavers and Joseph model is used to study the effects caused by slip velocity. The Tipei model and the Shliomis model have been used to derive a new structure for the Reynolds equation which can be used to calculate thermal variation.

In this theoretical study mathematical model has been developed for various types of squeeze film bearing systems such as circular, slider, short, conical. This attempt is made to create a more pragmatic and applicable situation. Expressions that can signify dimensionless form of pressure and bearing load carrying capacity are found using Reynolds' equation. The load carrying capacity equation is then solved numerically with the help of Simpson's 1/3 rule to analyze the impact on the bearing system. From the graphical study representation, it can be concluded that Ferrofluid lubrication based on the Shliomis as well as Neuringer and Rosensweig model can significantly neutralize the negative effects of the bearing's roughness on its load carrying capacity. This research will reflect very positive impact in the discipline of Tribology, not only that this study will up bring the level of industrial need.

List of Publication(s):

1. A Study of Ferrofluid Lubrication Based Rough Sine Film Slider Bearing With Assorted Porous Structure. *Acta Polytechnica, 59(2),* 144-152, 2019. doi.org/10.14311/ap.2019.59.0144 (Web of Science and Scopus indexed, UGC listed)
2. Lubrication of Rough Short Bearing on Shliomis Model by Ferrofluid Considering Viscosity Variation Effect. *International Journal of Mathematical, Engineering and Management Sciences, 4(4),* 982-997, 2019. doi.org/10.33889/IJMEMS.2019.4.4-078 (Web of Science and Scopus indexed, UGC listed)
3. Influence of Ferrofluid Lubrication on Longitudinally Rough Truncated Conical Plates with Slip Velocity. *Mathematical Journal of Interdisciplinary Sciences, 7(2),* 93-101, 2019. doi.org/1015415/mjis.2019.72012 (UGC listed)
4. Numerical Modelling of Shliomis Model Based Ferrofluid Lubrication Performance in Rough Short Bearing. *Journal of Theoretical and Applied Mechanics, 57(4),* 923-934, 2019. doi.org/10.15632/jtam-pl/112415 (Web of Science and Scopus indexed, UGC listed)
5. Effect of Slip Velocity on a Ferrofluid based Longitudinally Rough Porous Plane Slider Bearing. *In: K. N. Das et al. (eds) Proceeding of 8th International conference on Soft Computing for Problem Solving- 2018,* VIT-Vellore, Tamil Nadu, India, 17-19 December 2018. *Singapore: Advances in Intelligent Systems and Computing series of Springer, 1048,* 27-41, 2020. doi.org/10.1007/978-981-15-0035-0_3 (Scopus indexed, UGC listed)