

Comparative Analysis of Groove and Dimple Shape Partially Textured Journal Bearing under Various Conditions

Category or Keywords

Surfaces and Interfaces- Numerical analysis, groove texturing, dimple texturing, load carrying capacity, frictional torque, coefficient of friction

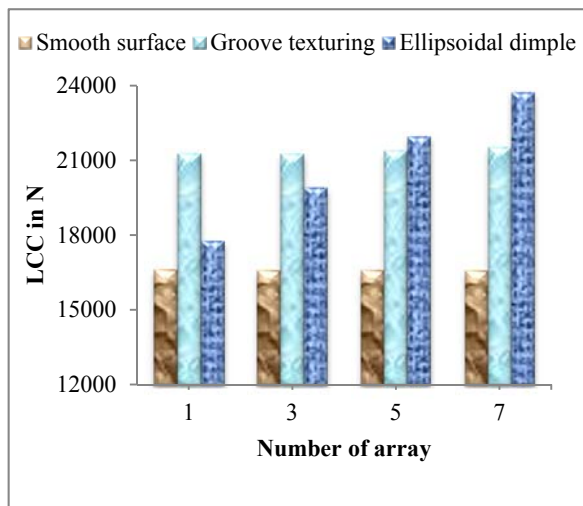
Authors and Institutions

Anil Shinde, S.P. Chavan, R.A. Kanai
Annasaheb Dange College of Engineering and Technology, Ashta, India

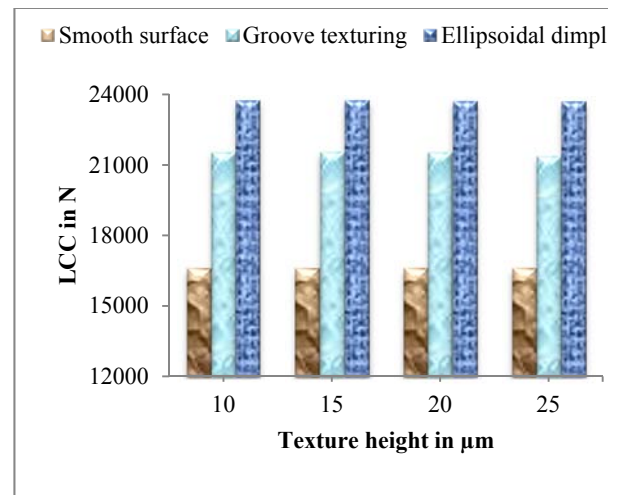
Abstract

1. Introduction
2. Three dimensional thin film flow modeling of journal bearing
3. Baseline models of journal bearing
4. Analysis of journal bearing with different texturing configurations
5. Results and discussion
 - 5.1 Load carrying capacity (LCC)
 - 5.2 Frictional torque (FT)
 - 5.3 Coefficient of friction (COF)
6. Conclusions

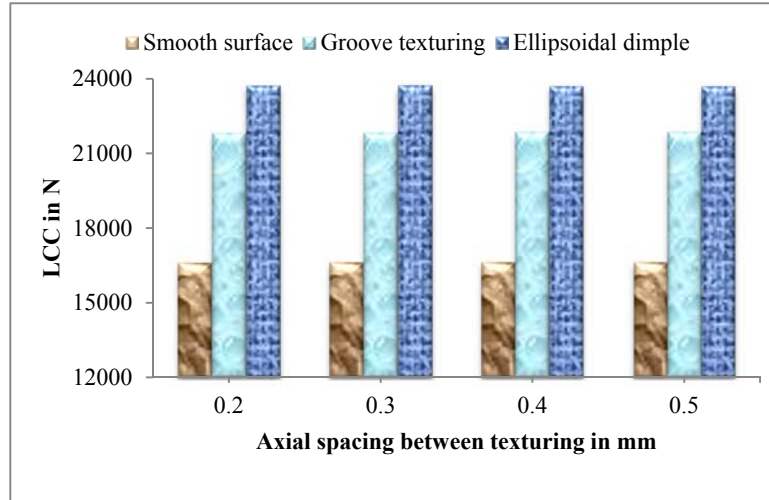
References



a)

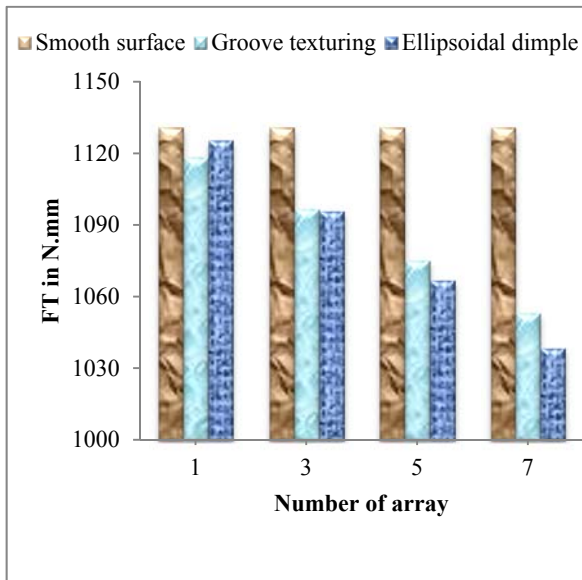


b)

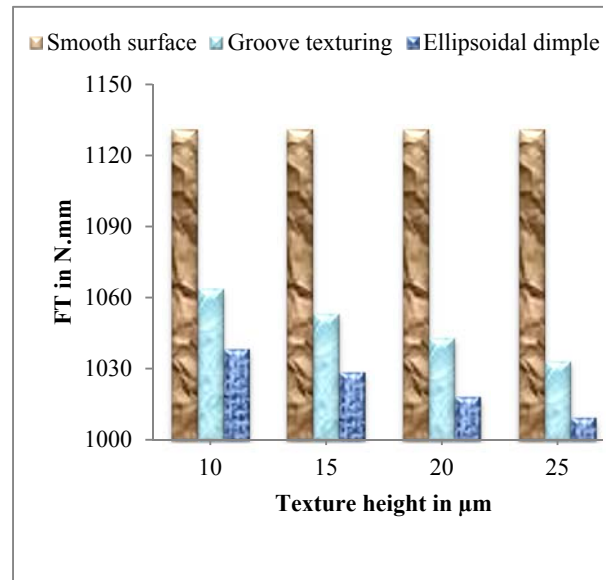


c)

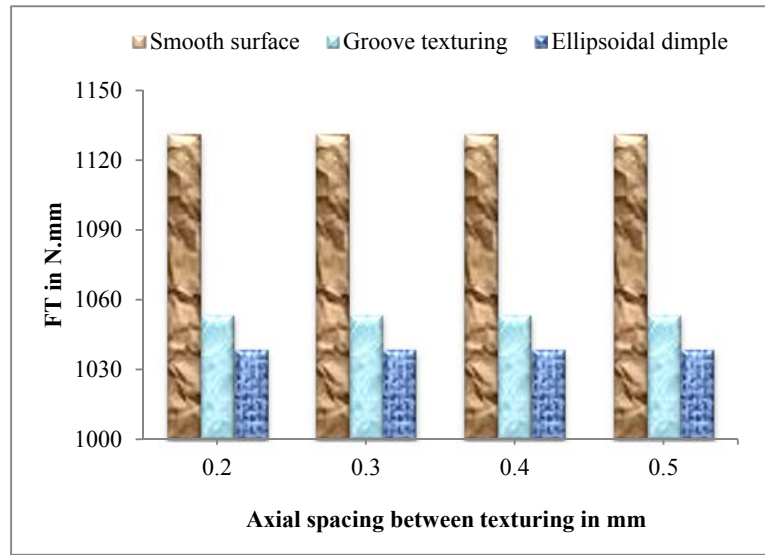
Fig. 6. Effect of texturing on LCC



a)

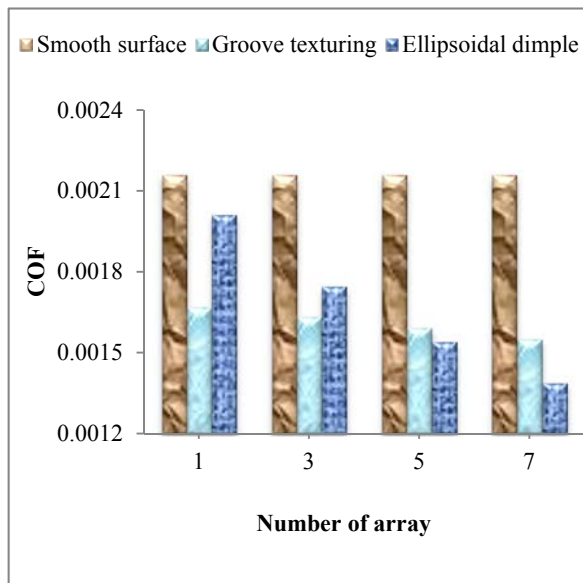


b)

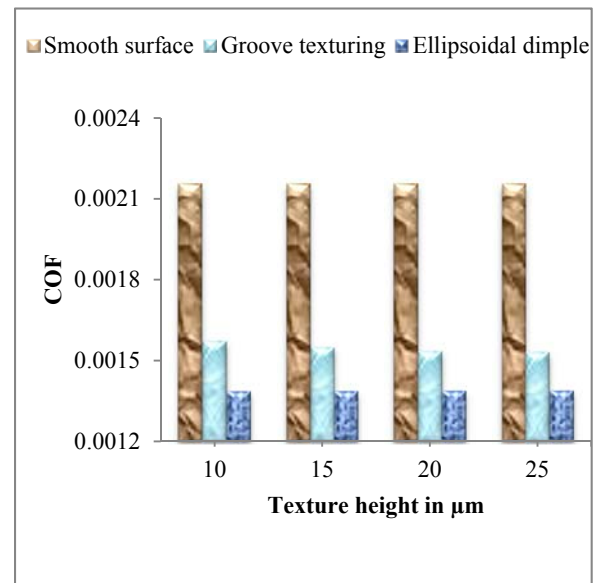


c)

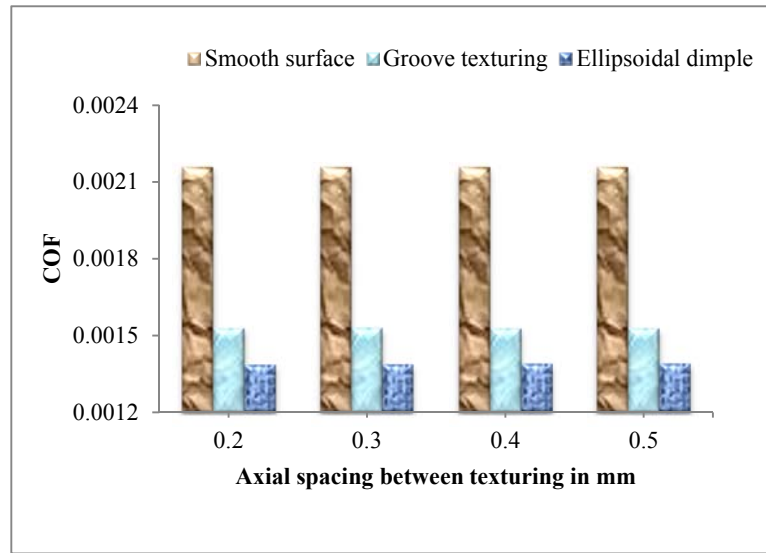
Fig. 7. Effect of texturing on FT



a)



b)



c)

Fig. 8. Effect of texturing on COF

REFERENCES

- [1] Hamilton D, Walowit J, Allen C. A theory of lubrication by micro-irregularities. Basic Eng. 1966; 88:17.
- [2] Kligerman Y, Etsion I, Shinkarenko A. (2005), "Improving tribological performance of piston rings by partial surface texturing." Journal of Tribology—Transactions of the ASME; 127:632–8.
- [3] Kovalchenko A, Ajayi O, Erdemir A, Fenske G, Etsion I. (2005), "The effect of laser surface texturing on transitions in lubrication regimes during unidirectional sliding contact." Tribology International; 38:219–25.
- [4] Tala-Ighil N, Maspeyrot P, Fillon M, Bounif A. (2007), "Effects of surface texture on journal-bearing characteristics under steady-state operating conditions." Proc Inst Mech Eng Part J: J Eng Tribol; 221:623–33
- [5] Tala-Ighil N, Fillon M, Maspeyrot P. (2011), "Effect of textured area on the performance of hydrodynamic journal bearing." Tribology International 44:211-219.
- [6] Lu X, Khonsari M. (2007), "An experimental investigation of dimple effect on the stribeck curve of journal bearings." Triplet; 27:169–76.
- [7] Cupillard S, Glavatskih S, Cervantes M. (2008), "Computational fluid dynamics analysis of a journal bearing with surface texturing." J. Eng. Tribol; 222: 97–108.
- [8] Qiu Y, Khonsari M. (2011), "Performance analysis of full film textured surfaces with consideration of roughness effects." J. Tribol.; 133:021704.
- [9] Dadouche A, Conlon M, Dmochowski W, Koszela W, Galda L, Pawlus P. (2011), "Experimental evaluation of steady state and dynamic of hydrodynamic journal bearings : plain versus textured surface." 10th EDF/ Prime workshop. Poitiers, France.
- [10] Brizmer V, Kligerman Y. (2012), "A laser surface textured journal bearing." Tribol; 134:031702.

- [11] Ashwin R, Akram W, Mishra S. Cannon A, Polycarpou A, King W. (2013), "Friction characteristics of microtextured surfaces under mixed and hydrodynamic lubrication." *Tribology International* 57; 170–176.
- [12] Meng F, Zhang L, Liu Y, Li T. (2015), "Effect of compound dimple on tribological performances of journal bearing." *Tribology International* 91; 99–110
- [13] Yu H, Wang X, Zhou F. Geometric shape effects of surface texture on the generation of hydrodynamic pressure between conformal contacting surfaces. *Tribol Lett* 2010;37:123–30.
- [14] Yu H, Deng H, Huang W, Wang X. The effect of dimple shapes on friction of parallel surfaces. *Proc Inst Mech Eng Part J: J Eng Tribol* 2011;225:693–703.
- [15] Peterson U, Jacobson S. (2007), "Textured surfaces for improved lubrication at high pressure and low sliding speed of roller/piston in hydraulic motors." *Tribology International*; 40:355–9.
- [16] Hakan A, Aydın B, Hasan S. (2011), "An experimental investigation on frictional behavior of statically loaded micro-grooved journal bearing." *Tribology International* 44; 1942–1948.
- [17] Shi X, Ni T. (2011), "Effects of groove textures on fully lubricated sliding with cavitation." *Tribology International* 44; 2022–2028.
- [18] Kango S, Sharma R K, Pandey R K. Comparative analysis of textured and grooved hydrodynamic journal bearing. *Proc Inst Mech Eng Part J: J Eng Tribol* 2014;228:82–95.
- [19] Vincent B, Maspeyrot P, Frene J., Starvation and cavitation effects in finite grooved journal bearing. In: *Proceedings of the 21st Leeds–Lyon symposium on tribology, lubricants and lubrication, tribology series 30, session 'machine elements'* (1994); p.455–64.
- [20] Shinde A, Pawar P. Multi-objective optimization of surface textured journal bearing by Taguchi based Grey relational analysis. *Tribology International* 114(2017); 349–357
- [21] Avraham Harnoy. *Bearing Design in Machinery Engineering Tribology and Lubrication*. New Jersey Institute of Technology Newark, New Jersey.
- [22] Elrod, H. G. and Adams, M. L., "A Computer Program for Cavitation and Starvation Problems," *Leeds-Lyon Conference on Cavitation*, Leeds Univ. England, 1974. (Available from BHRA, Cranfield, Eng.)
- [23] H. G. Elrod. A Cavitation Algorithm. *Journal of Lubrication Technology* JULY 1981, Vol. 103/351.
- [24] Bernard J. Hamrock . *Fundamentals of Fluid Film Lubrications*. NASA Reference Publication 1255.

