

Effects of surface texture on journal-bearing characteristics under steady-state operating conditions

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Abstract: Developments in microscopy have a profound effect on the resurgence of tribological applications at the microscopic level. Using surfaces with controlled micro geometry may prove an effective approach to improving bearing performance. It is consequently of interest to study the lubrication of journal bearing systems taking into consideration the effect of surface geometry design. A numerical approach is used in the analysis of texture effects on bearing characteristics. The results from investigating the performance of bearing surfaces with spherical dimple textures suggest that contact characteristics such as minimum film thickness, maximum pressure, axial oil film flow, and friction torque may be improved through an appropriate surface texture geometry and appropriate textures distribution on the contact surface. The main purpose of our work is to model and understand the evolution of journal-bearing characteristics with textures. A rigorous methodology is recommended. The work is divided into two steps. The first one serves to quantify the evolution of the characteristics with the texture parameters and to deduce their optimized values. The second step enhances the performance of the journal bearing by progressively taking into account the optimized values of texture parameters, especially the textures disposition.

Keywords : textured surface, dimples, Hydrodynamic lubrication, journal bearing, Finite difference method