Abstract

A wisely chosen geometry of micro textures with the favorable relative motion of lubricated surfaces in contacts can enhance tribological characteristics. In this paper, a computational investigation related to the combined influence of bearing surface texturing and journal misalignment on the performances of hydrodynamic journal bearings is reported. To this end, a numerical analysis is performed to test three texture shapes: square “SQ”, cylindrical “CY”, and triangular “TR”, and shaft misalignment variation in angle and degree. The Reynolds equation of a thin viscous film is solved using a finite differences scheme and a mass conservation algorithm (JFO boundary conditions), taking into account the presence of textures on both full film and cavitation regions. Preliminary results are compared with benchmark data and are consistent with a positive enhancement in misaligned bearing performances (load carrying capacity and friction). The results suggest that the micro-step bearing mechanism is a key parameter, where the micro pressure recovery action present in dimples located at the second angular part of the bearing (from 180° to 360°) can compensate for the loss on performances caused by shaft misalignment, while the micro-pressure drop effect at the full film region causes poor performances. Considering the right arrangement of textures on the contact surface, their contours geometries can have a significant impact on the performance of misaligned journal bearings, particularly at high eccentricity ratios, high misalignment degrees and when the misalignment angle α approaches to 0° or 180°.