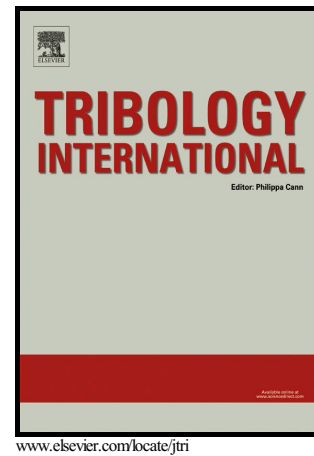


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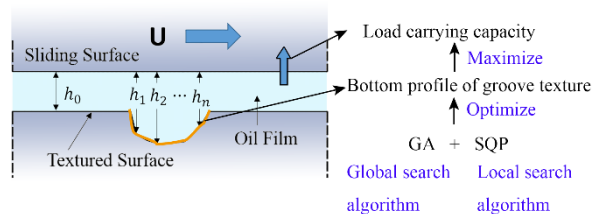
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Abstract

Most of the previous studies on the surface texture were based on pre-determined shapes and distributions, and the global-optimum shapes were uncertain. In this paper, a general parametric model of the groove bottom profile (inner structure, depth profile) of thrust bearings was developed and the GA-SQP hybrid method was adopted to obtain the global-optimum profile of the groove texture bottom. The optimization target was the maximization of the load carrying capacity (LCC) of the oil film. The results verified the superiority of the proposed GA-SQP hybrid method. The mechanism of the optimized bottom profile was investigated using the commercial software FLUENT®.

Graphical abstract



High load carrying capacity can keep stable lubricant film so as to avoid direct contact of the fiction pairs under high load. The load carrying capacity can be solved by Reynolds equation. On the basis of Reynolds equation, it can be found that the change of fluid film thickness is the intrinsic cause of hydrodynamic effect. Moreover, bottom profile of surface texture is one of the determinants of fluid film thickness. A general parametric model of groove bottom profile was developed and GA-SQP hybrid method was adopted to optimize the surface texture bottom profile. The mechanism of the optimized bottom profile is revealed. The optimized bottom profile keeps the cavitation area and suppresses the formation of the vortex in surface texture.

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