Hydrodynamic flow analysis for determination of the location of surface texture features

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1. INTRODUCTION

Surface texturing has been widely employed to ameliorate the conditions of various tribological contacts [1]. Despite the promise of surface texturing to enhance tribological performance the large number of parameters to be considered is prohibitive. The use of partial surface texturing incurs the additional consideration of where to begin and terminate the textured region, particularly for reciprocating sliding contacts.

In a recent study Cuppilard et al [2] investigated the effect of surface textures on an incline pad slider bearing contact. It was noted that introducing surface features in the recirculation region led to exasperation of the swirl flow and reduced load carrying capacity.

Following the work in [3-4] on describing the inlet boundary conditions in hydrodynamic regime of lubrication, the current research, details a simple analytical solution of Reynolds equation, which can be used to determine optimal texture parameters such as depth, start position and end position through consideration of flow recirculation at the inlet in a more time efficient and practical manner.

2. METHODOLOGY

The current study is based on solving a one dimensional Reynolds equation. The boundary conditions are similar to those described by Rahmani et al [5]. In addition, the profile of the slider is described in a generic form for the parabolic shape sliders as: $h(x) = \frac{h_c x^n}{(b/2)^2} + h_0$.

3. RESULTS

The results in Figure 1, demonstrate the percentage of improvements in load carrying capacity for different converging-diverging parabolic-shape slider profiles. In this figure the percentage of improvement is described as function of the distance between the recirculation boundary and the texture position.

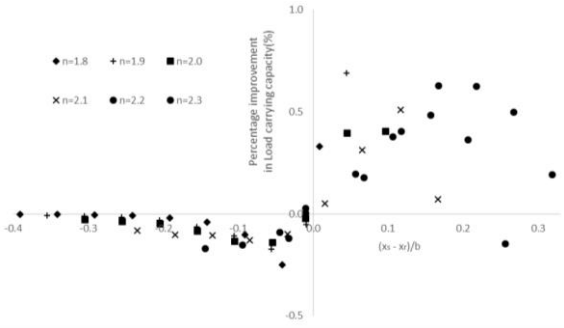

Figure 1: Percentage of improvement in load carrying capacity as a function of loci of recirculation boundary and texture positioning

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