

Truncated lubrication of an EHD spinning contacts

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The effect of the proximity of an edge of the solid bodies in an EHL contact is considered in this study. The goal is to be able to define a degree of truncation before reaching the critical point where bearing performance will not be optimal. This study deals with both a numerical and an experimental investigation. Application to the flange/roller-end (spinning) contact in rolling element bearings is considered.

Keywords (from 3 to 5 max): Elastohydrodynamic lubrication, Roller bearing, Truncation

1. Introduction

Most of the studies made on the contact mechanics consider elastic half spaces, i.e. extending the solid bodies to infinity in 2 directions. However, this assumption can no longer be considered if the contact area is close to the edge of one of the bodies in contact. This approach could be applied to a large number of mechanisms. However, this study will focus on the case of a spinning contact in EHD lubrication as can be found in most roller bearing, more precisely on the roller-flange contacts (see Figure 1).

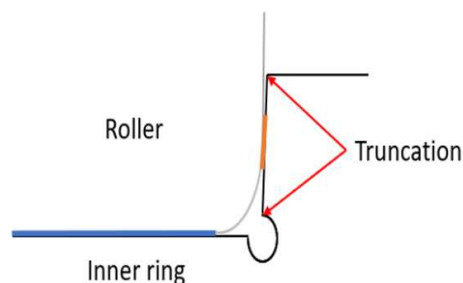


Figure 1- Roller-flange contact

Experimental and numerical works from literature studied the influence of spinning on specific aspects of the roller-end/flange contact, notably, the friction levels, the thermal effects and the geometry and the starvation [1]. In this case, as always, an elastic half space was supposed and edge effects were not be taken in consideration.

The literature review on the topic is really poor, however two points are underlined. An effect of the edge on the indentation for a distance of $10a$ is considered if the contact area is in the vicinity of an edge [2]. And higher thermal losses on the truncated part of the contact if the truncation is localized in the theoretical contact area [3].

2. Materials and Methods

Dedicated test rigs are used in this study. Tribogyr test rig was design especially to reproduce a real roller-flange contact at 1:1 scale.

The correlation between the proximity of an edge and the film thickness, friction and thermal dissipation in the contact is discussed. For this, the distance between the center of the contact and the edge need to be clearly define. In fact, the real edges often present a fillet or a chamfer. Tests are done by varying the $d_{\text{truncation}}$ distance (see Figure 2) until reaching a critical value where the contact no more operates in the EHL regime.

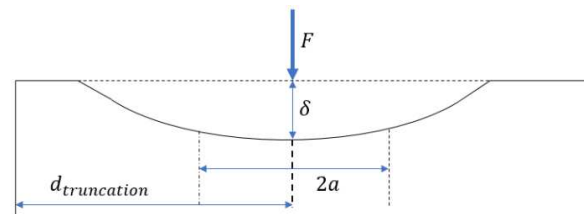


Figure 2 –Distance definition of truncation

4. References

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