Karlsruhe Institute of Technology

Institute of Fluid Mechanics
Building 10.23, Kaiserstraße 10, D-76131 Karlsruhe
http://www.istm.kit.edu

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Master-Thesis – numerical

Unsteady numerical simulation of the pressure distribution in a ball-on-disc tribometer

Background

Friction reduction in lubricated bearings can significantly increase the efficiency of machines. A well-directed change of the bearing geometry through surface textures can manipulate the lubrication film, thus resulting in higher load carrying abilities or lower friction losses of the bearing. The bearing's operating conditions can be replicated experimentally with tribometers. The numerical investigation is performed by modelling the lubrication film with the Reynolds equation. The combined experimental and numerical analysis of the conditions in the lubrication gap aims at finding general statements about the potential of surface texturing in bearings.

Content of the Thesis

The goal of the thesis is the enhancement of a MATLAB code which models the elastohydrodynamic condition in the lubrication gap of a ball bearing under consideration of mass-conserving cavitation. Firstly, the upwind interpolation used in the code shall be replaced by a quadratic upwind interpolation. Then, the time dependency is introduced to the code. Lastly, the developed model is validated by comparing its results to experimental and numerical literature data of ball-on-disc tribometers.

Literature

MOURIER, L., D. MAZUYER, A. A. LUBRECHT and C. DONNET, 2006. Transient increase of film thickness in micro-textured EHL contacts. *Tribology International*, **39**(12), 1745-1756.

SPIKES, H. A., 2006. Sixty years of EHL. *Lubrication Science*, **18**(4), 265-291.

WOLOSZYNSKI, T., P. PODSIADLO and G. W. STACHOWIAK, 2015. Efficient solution to the cavitation problem in hydrodynamic lubrication. *Tribology Letters*, **58**(1), 18.

Requirements:
Basic knowledge of numerical fluid mechanics and programming

Beneficial Skills:
MATLAB

Start: immediately

Contact:

M.Sc. Erik Hansen

Institute of Fluid Mechanics
Kaiserstraße 10,
Building 10.23, 6th floor,
Room 607

☎ +49 721 608 43027
✉ erik.hansen@kit.edu