

December 17, 2019

Master-Thesis

# Numerical optimization of laser textured surfaces

## Background

Tribological research aims at improving the performance of a big variety of devices which strongly impact on our every day life. Microtexturing of a surface can be an efficient tool for this purpose which has been proven to reduce the friction losses dramatically. For this reason, a careful optimization of such textures results crucial in order to increase the efficiency of plenty of applications.

## Content of the Thesis

The main aim of this thesis is the shape optimization of tribological surfaces in order to reduce friction and power losses in sliding contacts. The optimization process will be based on an in-house elastohydrodynamic solver since the best advantages of surface texturing occur in the mixed lubrication regime (Figure 1a). The investigated geometry will be the one of a pin-on-disc tribometer (Figure 1b) in order to ease the calibration of the model and the comparison with experimental data. The adjoint optimization will be then applied to the elastohydrodynamic solver in order to find the optimal surface design which minimize the friction coefficient.

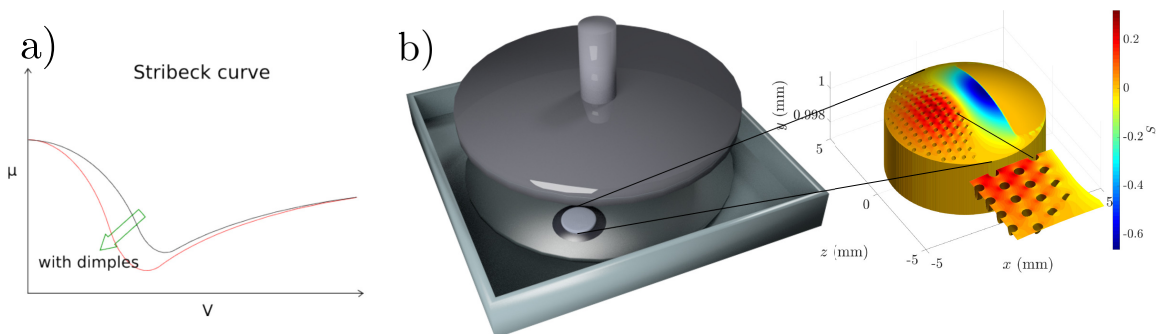


Figure 1: a) Qualitative impact of surface texturing on the Stribeck curve. b) Schematics of the pin-on disc tribometer [left] and magnification of the textured surface of the pin [right].

## Requirements

Knowledge of fluid dynamics and structural mechanics

## Beneficial Skills

Simulation of tribological phenomena  
Design and optimization of sliding contacts

**Start:** immediately

## Contact:

Dr.-ing. Andrea Codrignani  
M.Sc. Erik Hansen

Institute of Fluid Mechanics  
Kaiserstraße 10,  
Building 10.23, 6th floor,  
Room 603

☎ +49 721 608 42368

✉ [andrea.codrignani@imtek.uni-freiburg.de](mailto:andrea.codrignani@imtek.uni-freiburg.de)

✉ [erik.hansen@kit.edu](mailto:erik.hansen@kit.edu)