Karlsruhe Institute of Technology

Institute of Fluid Mechanics
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10th December 2018

Master-Thesis – numerics

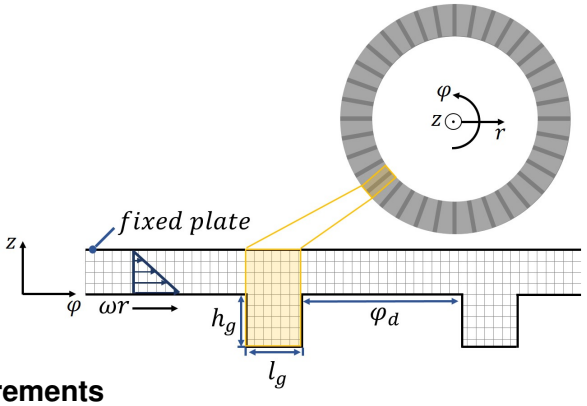
Impact of disc grooving on the flow field in an open wet clutch

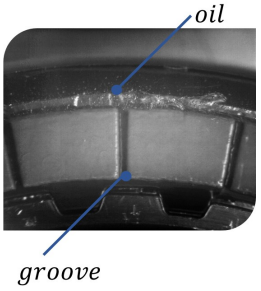
Background

Fuel saving trends of the automobile industry remain highly important due to a strict regulation of vehicle CO2-emissions. In this respect, one of the potentially interesting improvements can be accomplished by optimization of wet clutches, which can be found in nearly all high-quality automobiles. Idling condition of a wet clutch presents an essential research topic in this area, since undesired drag torque is generated due to strong shearing of the oil in open clutch state. In order to optimize clutch performance in respect to thermal design and drag torque reduction, grooves are introduced on the clutch discs. Interaction between fluid flow and the shape of the introduced grooves is the main focus of the present work.

Content of the Thesis

In this thesis we perform numerical simulations utilizing a model of an automotive clutch with the aid of computational fluid dynamics (CFD) toolbox OpenFOAM or Ansys Fluent. The main goal of the work is to improve the understanding of the grooving effect. For that a parametric study with variation of groove geometry is to be performed. An implementation of radial and waffle groove patterns has to be considered and compared to the analytical counterpart models implemented in Matlab. Optionally, the process of aeration, which leads to a significant decrease of drag torque can be considered (multiphase simulation).





Requirements

good knowledge in fluid mechanics,
experience with CFD-tools

Beneficial Skills

understanding of open clutch
flow fields concepts,
OpenFOAM or Ansys Fluent, Matlab

Start: immediately

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