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FRICTIONAL CONTACTS WITH LUBRICATION – BASICS AND APPLICATIONS

TRACK NUMBER 1500 - FLUID-STRUCTURE INTERACTION, CONTACT AND INTERFACES

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ABSTRACT

In the field of mechanical engineering, tribology effects play an essential role for robustness and reliability in energy conversion processes. While many technical devices are intended to operate at a high friction level (for instance brakes and clutches), most systems are designed to run under conditions with low friction and minimized wear (such as bearings and joints). The latter guarantees low mechanical energy loss (and thereby high efficiency factors) and high durability. The most commonly used methods towards reaching this goal are: covering the surface(s) with a hard and smooth coating or adding a lubricant. Conventional lubricants are oils and greases, but also other fluids (such as alcohols, carbon hydrates or water) are also used in practice. The transport of the lubricant through the contact zone between two solid surfaces causes the buildup of a normal pressure transmitted by the fluid. Consequently, the two surfaces tend to separate from each other, leading to a reduction of friction and wear.

This fundamental principle is influenced by contact geometry, associated materials, and load conditions, and is typically depicted in the Stribeck curve, which displays variations of the friction coefficient with respect to the respective tribological regime. Usually, the Stribeck curve is divided into four characteristic regimes: “dry friction”, “boundary lubrication”, “mixed lubrication” and “hydrodynamic lubrication”, corresponding to the portion of pressure transmitted by solid-solid contact (from 100 % for dry friction to 0 % for hydrodynamic lubrication).

The limited stiffness of tribological contact partners provokes deformation that significantly influences the characteristic of the lubricant gap and, consequently, affects friction and wear. In order to model this process, the coupled interaction between the fluid flow and the elastic solid bodies must be taken into account. Due to the complexity of this field, and its inherent economic significance, it has become the subject of an ever-growing body of research.

This Minisymposium is directed towards scientists interested in fundamental investigations of this type of contact, as well as scientists interested in research on the macroscopic scale of practical lubricated systems. Both, model-based and experimental research is welcome.