EHL Simulation Model for an Abstracted Piston-Bushing Test Bench

CATEGORY OR KEYWORDS

EHL Simulation, Axial Piston Pump, Piston - Bushing, Validation

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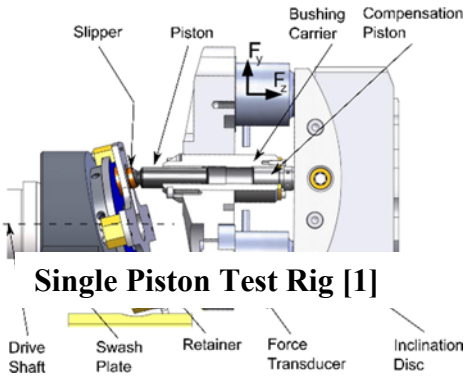
INTRODUCTION

Swash plate design axial piston units are often used as pumps and motors in mobile and stationary applications. The power loss of those units is mainly caused by the tribological contacts cylinder block/valveplate, slipper/swashplate and piston/bushing. For the piston/bushing contact, experimental investigations have already been carried out by Vatheuer [1]. In order to have a better understanding of the results, the test rig [1] will be simulated using an EHL simulation. Former simulations were using a 1D approach [2]. 3D thermal simulations have also been carried out [3].

ABSTRACT

In addition to the experimental tribological investigations on the single piston test rig, an analysis of the same system will be carried out using a multibody simulation. This includes, according to the degree of abstraction of the model, the lubricated contacts piston/bushing, slipper/swash plate and slipper/piston through an elastohydrodynamic (EHL) contact model. Effects, such as forces due to the multibody dynamics, the deformation of the components, the pressure build-up in the lubricating gap by hydrodynamics and contact pressure behavior have to be taken into account. A neglect of mixed friction and boundary friction states, in particular at the bearing edges, is not permitted. Friction and wear behavior of commercially available swashplate machines suggests that conclusion. Simulations will be done using FIRST, a commercial computer program. The calculation of tribological problems using multibody simulation models, in which lubricated contact points are represented by EHL couplings can be regarded as an established method. In this context reference is made to the numerical analysis of plain bearings. The focus is on the calculation of the piston/bushing contact. In a model analysis, the neighboring contacts slipper/swashplate and slipper/piston are considered.



Single Piston Test Rig [1]

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