2017 STLE Annual Meeting and Exhibition

Hyatt Regency Atlanta
Atlanta, Georgia

2017 Preliminary Technical Program
as of 1/27/17

Rolling Element Bearings III - EHL and Friction

Session Chair: F. Sadeghi, Purdue University, West Lafayette, IN
Session Vice Chair: F. Ville, INSA de Lyon, Villeurbanne, France

8:00 am - 8:30 am
Numerical Investigations on Drag of Cylinders in Cylindrical Roller Bearings
Yann Marchesse, Christophe Changenet, ECAM LYON, Lyon, France, Fabrice Ville, LaMCoS INSA LYON, LYON, France

In high-speed rolling element bearings the mixture of air and lubricant as oil generates an aerodynamic drag force on the moving elements. The authors showed previously using a simplified computational fluid dynamics approach that this force cannot be ignored for rolling ball bearings. This simplified approach is applied this time to cylindrical roller bearings for which the flows would be different. The influence of gap between consecutive cylinders and the presence of walls like the cage and the rings on the cylinder drag coefficient are investigated. The results that are obtained from both ball and cylindrical roller bearings are compared. Furthermore the influence of the drag coefficient value that is reached for cylinders on the temperature distribution in the rolling element bearing is investigated.

8:30 am - 9:00 am
Traction in EHL Contacts based on Local Temperature Measurements
Norbert Bader, Gerhard Poll, Leibniz University Hannover, Hannover, Germany

To reduce losses in rolling element bearings the understanding of traction plays an important role. Whilst the film thickness has been extensively studied, traction calculations rely heavily on assumptions and rheological models. Whilst many rheological models have been proposed based on empirical data from traction tests, these models often miss a physical explanation of the fluid behaviour in the contact. This is due to the fact, that most of these models are based on integral results. In the following paper the authors present a model for the maximum shear stress and a method to calculate traction based on this model. The integral traction data is however, supported by local temperature measurements conducted with infrared thermographic camera. Thus the integral model of the maximum shear stress is supported by local temperature data leading to good agreements between experiment and simulation. Furthermore this may allow a better understanding of the physical fluid characteristics.

9:00 am - 9:30 am
Influence of Surface Micro-Geometry on RCF: a Numerical Approach with a Microstructure Representative Model
Fabrice Ville, Guillaume Vouaillat, LaMCoS - INSA Lyon, Villeurbanne, France, Jean-Philippe Noyel, LabECAM - ECAM Lyon, Lyon, France, Xavier KLEBER, MATEIS - INSA de Lyon, Lyon, France, Christophe Changenet, LabECAM - ECAM Lyon, Lyon, France, Sylvain RatherY, SAFRAN Transmission Systems - SAFRAN Group, Colombes, France

Surface micro-geometries are known to have a major effect on rolling contact fatigue of industrial components. Several models have already been proposed in the literature to estimate this influence and predict bearings or gears fatigue life. The present study focuses on a new approach that combines both a contact pressure computation resulting from smooth, rough or dented surfaces and a numerical approach based on a microstructural representation of steel. The model estimates the number of cycles before first micro-crack nucleation and their location at grain boundaries inside the material. The study investigates the influence of contact parameters and material characteristics on rolling contact fatigue life.