

## PhD position proposal

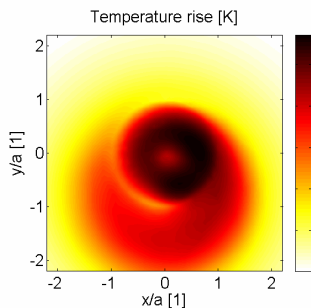
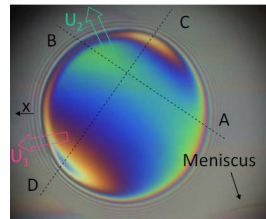
# The lubrication of large-size spinning non-circular contacts



**Context** The study concerns the lubrication of large-size spinning thermo-elastohydrodynamic contacts, as those found in the flange – roller-end contacts in roller bearings. They are characterized by their large dimensions and radii of curvature, by the contribution of several velocity components, by the intense power dissipated within the conjunction and by severe operating conditions.

**Topic:** The work will cover both experimental and numerical aspects in approx. equal proportions.

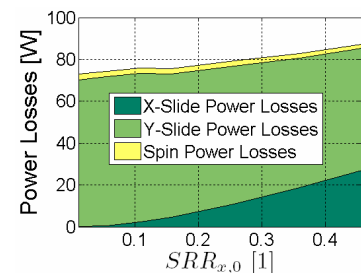
The experimental part, carried out with a state-of-the-art test-rig, will include friction and lubricant film thickness measurements. To get closer to reality, the project aims to study non-circular contacts and the influence of lubricant starvation and surface features.



The existing multi physics FEM model of large-size lubricated spinning contacts will be developed to include severe lubrication conditions like starvation, non-circular contact geometry, as well as the real solid bodies' dimensions.

This double experimental & numerical approach will allow a quantitative exploration of lubrication mechanisms (film thickness, friction, power and

thermal dissipation) in presence of spin with a focus on the influence of diverse operating conditions.



**Keywords:** spinning lubricated contacts, large-size contacts, roller bearings, EHD lubrication, thermal dissipation, power losses, *in situ* techniques, lubrication modeling and multi physics simulation

**Support:** 3-year INSAVALOR contract, fully financed by SKF, world leader in bearing manufacturing. This project could begin at any time from January 2013, depending on the availability of the candidate.



**Scientific environment:** This project will take place at LaMCoS (Laboratoire de Mécanique des Contacts et des Structures, CNRS UMR5259, <http://lamcos.insa-lyon.fr/>) located at INSA-Lyon. The PhD period could include visits at the SKF Engineering & Research Centre in the Netherlands or any other SKF site related to the PhD topic.

**Supervision:** Philippe Vergne, Directeur de Recherche CNRS, Nicolas Fillot, Maître de Conférence, David Philippon, Maître de Conférence (LaMCoS) & Guillermo Morales-Espejel, Senior Research Engineer (SKF-ERC).

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### References

- W. Habchi: *A full-system finite element approach to Elastohydrodynamic Lubrication Problems: Application to ultra-low-viscosity fluids*. PhD thesis, 2008, INSA-Lyon. <http://theses.insa-lyon.fr/publication/2008ISAL0038/these.pdf>  
 H. Dormois : *Frottement dans les contacts EHD de grandes dimensions, rôle du pivotement*. PhD thesis, 2008, INSA-Lyon. <http://theses.insa-lyon.fr/publication/2008ISAL0091/these.pdf>  
 T. Doki-Thonon: *"Thermal Effects in Elastohydrodynamic Spinning Circular Contacts"*, PhD thesis, 2012, <http://theses.insa-lyon.fr/publication/2012ISAL0058/these.pdf>.