

Cette soutenance sera défendue le mercredi 20 Novembre à 9h30 devant le jury composé de:

Nicolas FILLOT, Professeur des Universités – INSA Lyon,
Directeur de thèse;
Andreas ALMQVIST, Professeur des Universités – Lulea University
of Technology, Rapporteur;
Max MARIAN, Professeur des Universités – Leibniz University
Hannover, Rapporteur;
Juliette CAYER-BARRIOZ, Directeur de Recherche – Centrale Lyon,
Examineur;
Nans BIBOULET, Maître de conférence (HDR) – INSA Lyon, Invité;
Arnaud RUELLAN, Docteur – SKF Aerospace, Invité.

Résumé anglais:

Rolling element bearings in helicopter gearbox are crucial components allowing the helicopter to fly. A failure of those components can lead to dramatic end like the crash of the helicopter or ditching while doing offshore operation. More than 1000 incidents involve a lubrication issue. Nowadays, helicopter must ensure a 30 minutes autorotation "run-dry requirement" when an oil shortage occurs. This work aims for a better understanding of the working ability of a rolling element bearing presenting an oil shortage, with the objective in the future to improve the run-dry requirement time.

To achieve it, this work does not consider a full rolling element bearing (too complex). Instead, it focuses on one contact between a rolling element and a raceway of a rolling element bearing. This work represents the first step in the understanding of the rolling element bearing undergoing an oil shortage. The extrapolation of the behaviour of one contact to the whole rolling element bearing would be the next step.

Experimental works dealing with Loss of Lubricant application (i.e. oil shortage) presented two different behaviours, stabilization and unstabilization of friction coefficient undergoing multiple overrollings. A numerical model enabling starvation of a Thermo-ElastoHydrodynamic Lubricated (TEHL) contact has been developed aiming for reproducing those experimental works. Starvation is introduced using an innovative method based on Moving Mesh. This numerical model has been validated with literature reference. Afterwards, it has been compared with experimental works on oil shortage. Interestingly, "safe" situations where the contact can run for a long time without lubricant feeding have been reproduced.