**GHENT UNIVERSITY**

## PhD Position – Computational Tribology

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| *Research Topic* | Active Control of Lubricant Temperature in Rolling Element Bearings |
| *Institute* | Ghent University, Belgium |
| *Departments* | EMSME - Dept. of Electromechanical, Systems and Metal Engineering |
| *Discipline* | Computational Tribology |
| *Research Group* | Soete Laboratory. |
| *Funding* | 4 years – 100% occupancy rate |
| *Statute* | PhD Student |
| *Min. Requirements* | Master of Science in Mechanical Engineering |
| *Assets* | Experience with CFD and OpenFOAM |

### Job description

**Context** – High performant and power dense electromechanical systems (e.g. weaving looms, compressors, gearboxes, drivetrains, …) need oil lubrication to reduce friction and resulting wear in a contact between two surfaces and to efficiently dissipate heat from the lubrication points. These systems consist of multiple oil lubricated bearings of various types, which typically operate under different and/or varying conditions (load, speed, temperature). Ideally the lubrication properties have been adapted to these operating conditions. However, in practice in most machinery a single uncontrolled lubricant circuit is used with multiple oil lubricated bearings, compromising the optimal lubrication properties. As such, each individual bearing operates under suboptimal lubrication conditions, leading globally to an increased Total Cost of Ownership (TCO) due to reduced energy efficiency, reduced component lifetime and increased maintenance and downtime.

In current project, strategies will be developed to actively control and optimize the local lubricant thermomechanical properties (i.e. viscosity, density, thermal conductivity, specific heat) per bearing (group) by active control of lubricant temperature and flow. This can be achieved through various scenarios (and combinations thereof): (1) lubricant conditioning – oil temperature and mass flow rate is preconditioned before entering the bearing and (2) raceway conditioning – shear heating of the lubricant in the contact areas and the solid body temperature are influenced indirectly via heat sinks or heat exchangers installed around the bearing surface

**Your job** – The envisioned PhD focusses on the development of an accurate and reliable transient 3D Thermo-Elastohydrodynamic lubrication model, involving precise constitutive modelling of relevant thermomechanical properties, for rolling-sliding contacts and builds upon existing CFD-FSI models constructed in the opensource software OpenFOAM. After validation to experimental results, the model will be used to analyse the influence of (active) temperature control on TEHL under dynamic operating conditions, and a thorough assessment of the effectivity of the proposed concepts at contact level will be made. As the contact model is part of a larger multi-scale approach, meta-models will be created serving as input to large-scale bearing calculations.

### Profile

1. You hold a Master degree in Mechanical Engineering.
2. You have a strong motivation for conducting scientific research at a high level.
3. You possess good analytical, and technical skills
4. You are interested in computational mathematics and High Performance Scientific Computing.
5. You have affinity with Tribology.
6. You have profound knowledge of Computational Fluid Dynamics and OpenFOAM
7. Experience with programming in C++, is an asset.
8. You take responsibility for the development of your project in a well-structured, thorough way, and you're able to solve problems independently. You display creativity in solving problems, generating ideas or finding new ways of working.
9. You have an open personality and willing to contribute to the team and participate in didactic projects.

*Prof. dr. ir. Dieter Fauconnier - dieter.fauconnier@ugent.be*
*UGent - EMSME - Soete Laboratory*

10. You have excellent communication skills in English, both orally and written.

## Contract

1. The PhD-project starts at earliest at May 1st 2021.
2. We offer an 100% research position for 48 months (4 years). After probation period of 12 months, a fixed-term contract will be offered on condition of positive evaluation.
3. The salary and appointment terms are consistent with the current rules for PhD degree students. The net salary for a starting PhD student (unmarried) is about €2000,-.
4. The scholarships for the PhD degree are subject to academic approval. The successful candidate will be enrolled in the doctoral program of Ghent University (http://www.ugent.be/doctoralschools/en ).

## Application

To apply, please complete the application form at https://forms.gle/wdP94BsRBhTAVKLp6 . Your application will be taken into consideration on condition that all fields in the application form are completed properly.