

Proposal for the Master's Thesis/Project Work

Modelling and simulation of eddy current processes

Modellierung und Simulation von Wirbelstromprozessen

Eddy-current problems occur in a wide range of industrial and metallurgical applications, particularly in process where electrically conducting materials are subjected to time-varying magnetic fields. These applications include heating, forming, joining and material testing, where inductive coupling between electromagnetic fields and conductive media place a central role in determining process performance and quality. Accurate numerical modelling of these phenomena is essential for understanding the underlying physics. This work aims to develop and/or improve a three dimensional simulation model for eddy current process using OpenFOAM®, an open-source CFD software. Selected reference cases from the literature will serve as the foundation for model development and validation. To benchmark and verify the OpenFOAM® implementation, comparative simulations will be performed using STAR-CCM+, a commercial multi-physics software.

The main objectives of this project work are as follows:

- Literature review to identify relevant reference cases and establish a theoretical foundation for modelling eddy current processes
- Familiarisation with OpenFOAM® and Star-CCM+
- Selection and preparation of reference cases for validation
- CAD model creation and grid generation
- Develop and/or refine a three-dimensional model in OpenFOAM®
- Performing a parameter study to investigate the influence of key parameters and compare results obtained from OpenFOAM® and Star-CCM+
- Documentation and evaluation of the results

Contact: M.Sc. Ravi G. Kewalramani

Tel.: 03731 39-2169

Email: Ravi.Kewalramani@ttd.tu-freiberg.de

Dr.-Ing. Aline Juenger

03731 39-2161

Aline.Juenger@ttd.tu-freiberg.de