



PhD student in Metallurgies and Finite Element Analysis

- Last application date: 2015-01-08
- Department: Department of Mechanical construction and production
- Contract type: Limited duration (4 years)
- Occupancy rate: 100%
- Vacancy type: Research staff

One PhD studentship position is available at the Department of Mechanical construction and production - Ghent University, Belgium.

In the frame of the IWT project 'DeMoPreCI-MDT - Development, Monitoring and Prediction of Coupled Interactions in Material Durability Testing', one position for a starting PhD student is available at the Department of Mechanical construction and production, Faculty of Engineering, Ghent University. Research area is situated in Metallurgies and Finite Element Analysis.

Project description:

The PhD studentship is concerned with residual stress calculation and aims to improve residual stress prediction of welded steel components for fatigue, corrosion and abrasion assessment. One approach to model residual stress in welds in FEA codes is to integrate Metallurgical transformations models with heat transfer analysis and thermal-stress analysis. ABAQUS python codes will be required to implement the interaction between these three different disciplines. For the diffusion phase transformation model, information about volume fraction of phase decompositions as function of time and temperature will be obtained and used as input parameters for the heat transfer analysis. Effect of incubation time, austenite grain size and Martensite transformation will be included in the metallurgic model. Heat transfer analysis includes heat conduction and latent heat due to solid phase transformation. Heat transfer parameters are function of the solid phase transformation decompositions and will vary within the FE weld geometry model according to time and temperature distribution. TTT diagram is required an input for the heat transfer model to determine phase transformation parameters. In the thermal-stress analysis, the mechanical properties will be function of space and temperature, and the thermal strain distribution obtained from the heat transfer analysis will be applied. Due to the continuous changes in the phase transformation, heat transfer and mechanical properties during the cooling process, the three analyses will be strongly coupled and the interaction between them may take place every time step. Validation of the proposed numerical model for residual stress prediction will take place at Labo Soete using DIC technique. A second approach could be based on Multi-scale Analysis using Molecular Dynamics and Atomic-Scale FEA. However, this PhD studentship will concentrate only on the first approach and according to the progress in the project the second approach may be considered.

Profile:

- Master degree in Materials, Civil, Mechanical Engineering or equivalent degree.
- Experience with Finite Element Analysis (ABAQUS).
- Fluent in English and programming languages.

Scholarship Salary:

The value of the scholarship at Ghent University depends on, a.o., the researcher's family situation and is approximately \in 1.830 a month.

Applications:

Please email your CV with the contact details of two references and a letter of motivation explaining your vision regarding the research topic to: Professor Magd Abdel Wahab (<u>Magd.AbdelWahab@UGent.be</u>) Department of Mechanical Construction and Production Faculty of Engineering and Architecture Ghent University Technologiepark Zwijnaarde 903 B-9052 Zwijnaarde, Belgium