

University of Technology Sydney

PFE / Master 2019

COMPANY or LABORATORY

University of Technology Sydney, 15 Broadway, Ultimo NSW 2007, Australia.

In collaboration with:

Department of Physics and Mechanics of Materials, Pprime Institute, 1 avenue Clément Ader, BP 40109, F86961 Futuroscope-Chasseneuil cedex, France.

SCIENTIFIC SUPERVISORS

First name: Carole

Name: Nadot-Martin

Service/Laboratory: Department of Physics and Mechanics of Materials, Pprime Institute.

First name: Sardar

Name: Malekmohammadi

Service/Laboratory: University of Technology Sydney.

DURATION 6 mois

DATES April to September 2019

MISCELLANEOUS INFORMATION

Financial allowance: UTS (2000 AUD) for 6 months.

NATURE OF THE PROJECT

R&D theoretical and numerical modelling

TITLE OF THE PROJECT

Analytical closed-form equations for reliability analysis of composites. Application to wood composites.

SUBJECT

The proposed research constitutes a part of a program performed in the context of a collaboration between Pprime (contact Prof. C. Nadot-Martin) and UTS (Dr S. Malekmohammadi). This program involves analytical and numerical modelling works using commercial software packages such as ABAQUS, Mathematica, MatLab, etc., to help with the multi-scale modelling of different types of composites.

The project aims to develop analytical closed-form equations for predicting the orthotropic elastic constants of strand- and veneer-based composite products. Such equations will be derived based on a "Morphological Approach" that has been proposed at Pprime for a large class of highly-filled composites. Although MA has been implemented numerically by the supervisors, simple closed-form equations are still required for reliability purposes and demonstrating the effect of various microstructural parameters on the composite mechanical properties. The developed equations will enable engineers to develop more robust standards for composite products. In the particular case of strand- and veneer-based composites, the developed equations will be compared with existing equations to highlight the ability of the MA to account for e.g. resin thickness, resin modulus, strand dimensions, etc and their variability on the overall behaviour. Furthermore, these equations will be incorporated into reliability software at UTS to improve the reliability of strand- and veneer-based composite products for designing tall timber structures.

The potential candidates will have the opportunity to interact with experts in the field of composites and engage with academics and engineers while working in an open-space, world-class, research facility (UTS TechLab) which has recently been opened in Sydney, Australia. Please visit <https://www.uts.edu.au/about/faculty-engineering-and-information-technology/tech-lab> for more details.

The candidate is expected to be a good communicator and be able to document his/her research findings on a regular basis in the form of reports and presentation slides.

SKILLS PROVIDED BY THE PROJECT

This project will provide important skills and expertise in the following fields:

- Multiscale modelling and corresponding coding with Mathematica, MatLab, Python,
- Composite materials.

For more details, please contact Carole Nadot-Martin (carole.nadot@ensma.fr).

For application, please send your letter and CV to Carole Nadot-Martin (carole.nadot@ensma.fr).