Master’s thesis or Term Project @ Hexagon MI – Materials BU  
Topic: Modeling of Composite Hydrogen Tanks  
Location: Belgium or Luxembourg

We’re looking for someone passionate about composites and engineering innovation, willing to actively assist us in demonstrating how our best-in-class composite modeling technology and methods can be used to assist the Automotive research and CAE teams in designing Hydrogen Tanks made of composites, through numerical simulation.

If you are young but talented and enjoy the composite world, join our team of composite experts and develop multi-disciplinary skills around materials and advanced nonlinear finite element modeling, to become the future composite expert!

Materials/ICME BU of Hexagon MI

The materials/ICME BU of Hexagon MI, formerly e-Xstream engineering, is a software and engineering services company 100% focused on state-of-the-art material solutions. We help our customers, material suppliers and end users across various industries (Auto, Aero, E&E…), to

- Investigate and predict the behavior of a large mix of composite materials
- Design & Manufacture Innovative High-Performance Composite Parts
- Minimize weight, cost and time-to-market of optimal composite industrial parts
- Improve prediction of structural FEA by accounting for manufacturing process
- Reduce material testing and prototyping
- Reduce material risk and turn it into a material strategy

All of this using Digimat, The nonlinear multi-scale material and structure modeling platform, and/or the expertise of the engineering services team.

Internship Description

Join the Customer & Engineering Services team, a multi-disciplinary team of engineers strived by the willingness to assist our customers in successfully characterizing their materials, managing their data, designing their parts, assessing effects of manufacturing processing. The purpose of this internship is to demonstrate how the existing Digimat technology can help engineers for designing and manufacturing H-Tanks made of Continuous Fiber Reinforced Composites (CFRPs). For this purpose, you will work on 2 modeling threads:

1) **Cure modeling of Hydrogen Tanks:** The curing phase generates internal stresses that, depending on the design and manufacturing conditions, can lead to weaknesses, local cracks... H-Tanks are manufactured via filament winding, a manufacturing process that yields various defects such as gaps between tows. The mission of the intern will be to demonstrate on a generic H-Tank how research and CAE engineers can leverage numerical modeling to model the curing process, predict residual stresses and local defects, and improve the design or manufacturing process to solve these defects. The intern will apply the modeling workflow illustrated in Figure 1 and automate it as much as possible.

![Figure 1: Cure Modeling Workflow](image)

2) **Effects of Defects:** As mentioned above H-Tanks are manufactured via filament winding which yields various defects such as gaps between tows. These defects are a real safety concern as it isn’t easy to quantify the degradation in material and part performance resulting from the defects. Today, the industry

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essentially relies on experimental testing to carry that out, this is expensive budget and time wise. As part of this internship, the intern will apply and illustrate how virtual testing methods can be used to complement experimental testing for assessing the influence of defects in the design and manufacturing process, accelerating as such the defect assessment process. Defects such as gaps between tows and porosity within tows will be addressed. The numerical study will start at coupon level and then be extended to generic H-Tank design.

In terms of deliverables, Hexagon expects the intern to deliver a full use case for each of these 2 modeling threads, automated canned workflows, technical reports with the details of the work achieved, and marketing collaterals. The latter are highly important, a major outcome of this internship is the ability to illustrate and convince industry players that Digimat is a highly valuable technology for assisting them in the design and manufacturing of their composite H-Tanks. Targeted marketing collaterals are 1-page case studies, short deck of dedicated slides illustrating the value proposition with workflow and use cases precisely applied on H-Tanks, training exercises...

This internship will be based in one of the e-Xstream's HQ: Belgium or Luxembourg.

Required Qualifications

- Student in Material or Mechanical Engineering
- Background fundamentals on composite materials, ideally familiar with material modeling
- Knowledge of finite elements, experienced with preparing and solving nonlinear FEA
- Think out-of-the-box attitude, smart & agile, ability to bounce back and be force of proposition
- Profile attracted by innovation and an environment to solve challenges daily
- Fluent in English

The Benefits

- Join a dynamic team of highly qualified and talented experts in the field of material & numerical modeling
- Develop yourself in a company offering leading edge technologies

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