

# Project description (First-time-right)

## Design of a calibration mould (Polyworx)

Internship for WTB, LT 4<sup>th</sup> year

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### Background

Manufacturing of composites can involve a lot of manual labour, which makes it more expensive and less consistent. In order to decrease the manual labour automation production technologies for composites require further development. Inholland Composites started a RAAK-MKB research project in September 2014, *Robocompo*, together with 10 SMEs with the aim to automate the vacuum infusion process. The project was a great success and the result can be seen in the Composite Labs in the form of a robot with several end-effectors.

One of the conclusions of the project was that almost the whole process can be automated, but the biggest challenge is controlling the infusion process itself. This subject resulted in a new RAAK-MKB project named: *First-time-right injections for the production of one-off or small series of composite products*. For this project the focus will be on improving the quality of the infusion in such a way that complex and one-off products can be infused in one try, instead of several tries that can be required. The plans to achieve this is using smart-moulds (with sensors and heating) to control the resin flow, vision systems to increase the quality of the build-up and advanced simulation models linked with real-time data and new disruptive concepts.

### Project description

The goal of this project is to design a system/mould to do an automated permeability / viscosity measurement on different fibers and resins. To do a simulation of an injection you need to know different parameters. By making a mould where certain parameters can be controlled and/or fixed the permeability of the laminate and viscosity of the resin can be derived.

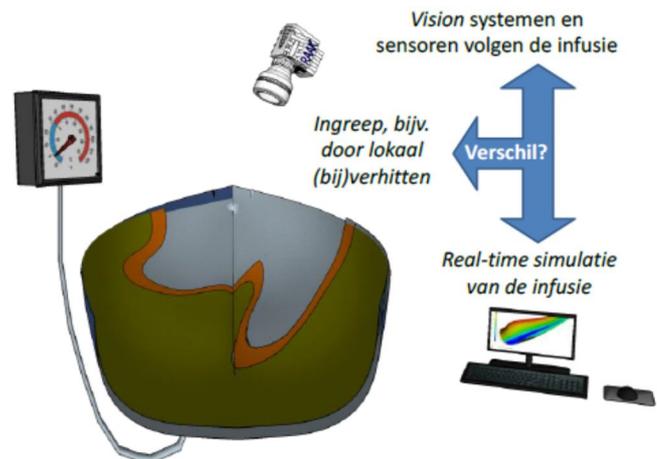
When a setup like this is available, it can be used to determine the parameters for unknown resins and fiber combinations by doing one small infusion. These parameters can then be used to run simulations for the final product.

1. Production of a prototype. It will result in a flat plate mould where the different parameters are well known. By this approach it will be easier to gain expertise in the RTM-Worx software from Polyworx. At the same time you get more comfortable using SALT script for the monitoring of the visualisation of the RTM-Worx GUI (Graphical User Interface)
2. Research to the possibilities to derive the parameters required for a simulation using a very simple test setup.

## Scope of work

During all projects at the First-Time-Right-projects it is intended for the student to gain practical experience with composites. So, even if you're working on a 'theoretical' business-case, you will have to get your hands dirty in the lab. Thus, during design you will learn about manufacturing methods and materials. We are striving to create physical demonstrators in the design projects. Furthermore, a typical scope of work consists of these elements:

- Project plan, research questions, research method
- Literature study, research on tool design, etc.
- Functional analysis and concept study
- Gain expertise in composites
- Detailed design
- Demonstrator for manufacturing samples
- Testing of the mould
- Analysis of test results
- Communication and interaction with stakeholders, companies and experts
- Technical report



## Company information

Inholland Composites, located at Inholland in Delft and Alkmaar, is a very well equipped, high-tech laboratory in the field of composite materials and structures. The focus is on fibre reinforced plastics which provide durable and lightweight solutions in a wide range of applications. Inholland Composites needs students from various technical departments and it's our mission to put theory into practice and provide students with up-to-date education which connects to today's business.