Project description (EFRO - Valorisatie)

Create a demonstrator for composite filament winding

Internship for: **WTB, TI, ET, LT** 3rd/4th year

Mike de Vogel, April 20, 2018

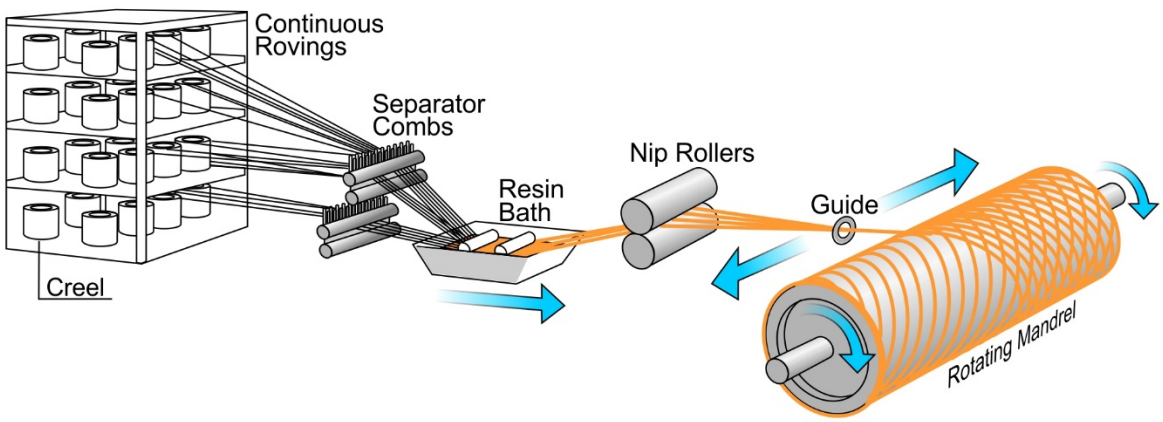
Background

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 several steps in the vacuum infusion process. This subject resulted in a new EFRO project named: *EFRO - Valorisatie.* 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

Filament winding is a fabrication technique which is used to manufacture different composite parts, for example open cylinders, pressure tanks or other prismatic parts. The part is created by winding single or bundled strings of filament under tension over a rotating mandrel. The mandrel rotates with a dynamically controllable speed while a guidance eye traverses on a carriage horizontally, applying the fibers in the desired pattern or angle on the part. Commonly used are fiberglass, carbon fibers, (but bio-fibers can also be applied) which are impregnated in a pool of resin before being wound onto the part. After the winding process the part is cured. Present-day methods of filament winding include a robot or a big manipulator to guide the filament to their destination. The project is to make a demonstrator for single string filament winding, in which it is possible to input the desired angle or pattern on the part.



Scope of work

During all projects at the EFRO-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 demonstrator
- 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.