Chair of Carbon Composites
TUM School of Engineering and Design
Technical University of Munich

Bachelor's Thesis, Term Paper

Ultrasonic-Assisted Impregnation Control in Calendering: A Process Development Approach

Pre-impregnated fiber material, known as towpreg, is increasingly used in Automated Fiber Placement (AFP) processes. Towpregs are manufactured in several stages: First, the fibers are stretched and passed through a drum-type resin bath. As the drum rotates, it applies a thin layer of resin onto the fibers. This resin is then evenly distributed across the fiber surface using heated roller systems. In the next step, the impregnated fibers pass through a calendering system, which further ensures uniform resin distribution. The final product is a spool of pre-impregnated fiber, commonly referred to as towpreg rovings. This process offers several advantages. The improved resin distribution enhances the mechanical strength of the final product. Additionally, the homogeneous impregnation contributes to improved structural stability and better fiber retention.

In this research project, a process will be developed for the ultrasonic treatment of impregnated glass fibers using a calender. The aim is to control the viscosity and improve fiber wetting in subsequent impregnation steps. To identify suitable approaches, an extensive review of current literature on ultrasonic treatment methods will be conducted. When selecting the most appropriate processes, key factors such as implementation time, costs and available resources will be carefully considered. Based on these findings, a concept for integrating ultrasonic treatment into the towpreg manufacturing process will be developed. A concept for experimental validation and optimization of the subsequent fiber impregnation will also be developed.

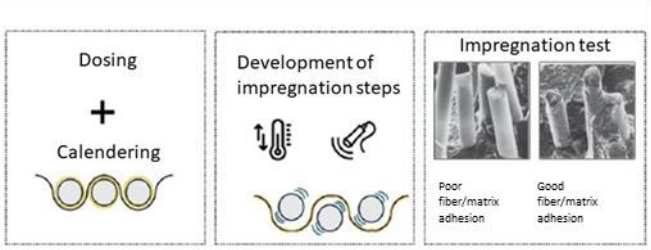

Figure 1: Developing Ultrasonic Impregnation

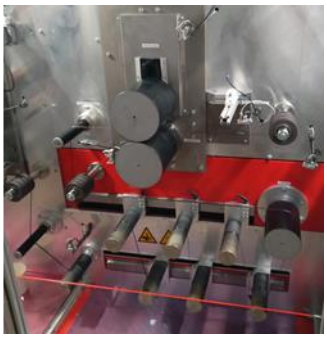

Figure 2: Impregnation Procedure at the Machine

Research focus of the thesis

- Research on impregnation with ultrasonic treatment
- Evaluation of Feasibility and Associated Costs of ultrasonic treatment
- Creation of an experimental setup
- Selection of testing methods for the analysis of Impregnation
- Analysis of the impregnation of Glass fibers

Requirements

- Reliable and independent way of working

Starting date: As soon as possible

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