Chair of Carbon Composites
Department of Aerospace and Geodesy
Technical University of Munich

Master's Thesis, Bachelor's Thesis, Term Project

Validation of a simulation platform for the prediction of Sheet Molding Compound flow behavior in automotive parts

Sheet Molding Compound (SMC) is a type of composite very attractive for the automotive industry. The material is made of carbon fibers cut into 25 mm long strands and randomly dispersed on a resin layer. In order to produce parts, the sheet-shaped prepreg is placed into a heated mold and compressed. Due to the heat, the viscosity decreases significantly, allowing the material to fill the entire cavity, even in very complex geometries. Together with very short cycle times of down to 3 minutes, and very good specific mechanical properties, this material is often the material of choice in the automotive industry. As for any other process, simulations can be performed to predict the best suitable processing conditions saving time and resources. Nevertheless, due to the nature of the material, a numerical representation of the material is very challenging. Therefore, the current approach still consists of the cost- and labor-intensive trial-and-error. Over the past years, an approach has been developed at LCC, to simulate the flow behavior of SMC considering its variability.

The aim of this Thesis is to validate the developed approach by comparing the numerical and the empirical results. Both the process simulation and the production of the parts will be included in the Thesis. In case of a Bachelor's Thesis only the simulation will be set up and compared to the production data that will be provided by the supervisor.

Figure 1: Rear door frame made of SMC [Toyota]

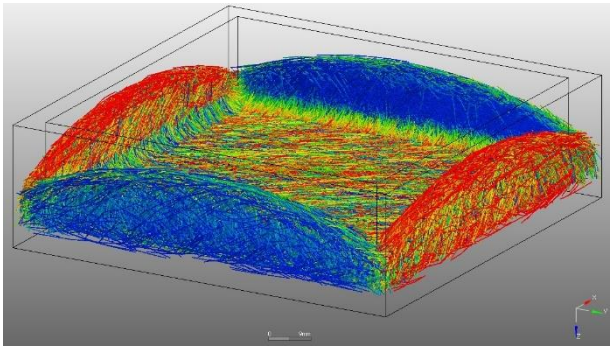

Figure 2: Flow and fiber orientation simulation in 3DTimon

Research Focus of the Thesis

- Literature research on SMC process and flow simulation software, especially 3DTimon
- Production of the validation geometries
- Setup of process simulations in 3DTimon
- Comparison of the outcomes of the simulations and the part production
- Documentation

Requirements

- Structured and precise way of working
- Experience with process simulation and CAD software is an advantage, but not a requirement

Starting date: Now

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