Project idea: AFP Process Simulation
Call area: Eureka Lightweighting Call 2025

Contact

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Project Description

The project idea is focused on the AFP process and associated arising topics such as detailed process simulation of fiber placement using **thermplastic / thermoset materials**, the **evaluation** and **assessment of occurring effects** and the **optimization of AFP manufactured components**. The project should further advance the capabilities of AFP by taking into account various aspects beginning from simulating the whole **process simulation chain** (simulation „as-built“ - e.g. considering process induced deformations PID) up to **optimization of fiber steering / path optimization** for exploiting the capabilities of placing fibers in arbitrary angles and thereby developing **variable stiffness components**.

Project Objectives

- Process simulation of AFP Process (thermoplastic/thermoset)
- Load path optimization (with respect to high steering angles)
- Near-net shape production / reduction of material waste
- Optimized components using AFP
- Variable stiffness components (may also be morphing structures)
- Effects of Effects
- Process monitoring

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Problem, State of the Art, and Envisioned Solution

Problem / State of the Art

- AFP = innovative process with a lot of research potential
    - a lot of **trial-and-error** due to complex thermo-mechanical material behavior
    - **Quality assurance** oftentimes still **manually** → Process monitoring
    - **Defect occurrence** especially for **high steering angles**
    - Lightweighting by **variable stiffness** – high research potential still not fully exploited

Envisioned Solution

- Process simulation for **thermoset & thermoplastic** components (maybe also in-situ consolidation) for process parameter determination
- Process simulation for predicting **effects of effects**, **PID**, **simulation "as-built"**
- **Defect detection** & **evaluation** of gathered data during process monitoring
- **Component design optimization** → variable stiffness components / integrated, morphing structures, loading path

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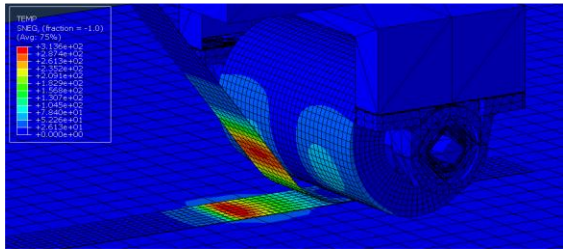
Our Partners, Our Know-How…

Currently no partners

Our Know-How

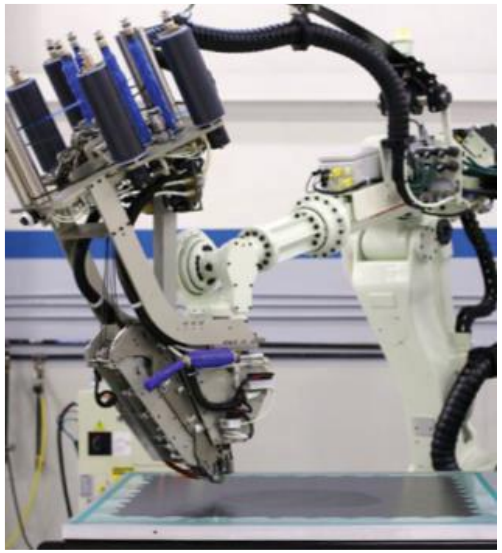
- Process simulation & process simulation chain (FEM)
- Structural Simulation
- Structural Optimization

- Automation of Simulation Tasks
- Effects of Effects
- Process Induced Deformations
- (Process monitoring)



We are looking for…

- Research / industrial partner with AFP equipment
- Expertise in AFP / draping
- Expertise in Big Data Analysis



(c) Kollmannsberger, A.M., Heating characteristics of fixed focus laser assisted Thermoplastic-Automated Fiber Placement of 2D and 3D parts, dissertation thesis, TU Munich, 2019.