

## Project FLEXOMAT: Flexible Positioning Tools for Machining of Fibre- Reinforced Composite Materials

### Motivation and Goals

Currently part-specific clamping devices are used for most shape cutting processes of fibre-reinforced composite materials.

Objective of the project FLEXOMAT is the development of a **flexible, intelligent and universally applicable solution for the positioning and clamping of parts made from fibre-reinforced composite materials**. This tooling shall allow to reach the same tolerances and part qualities as with a part-specific clamping device.

### Approach

Actuators are applied to ensure the adaptability of the tooling to different parts, which can be positioned flexibly. Contact to the part is ensured by vacuum suction cups, which are attached to the actuators. Besides classic suction cups, also special form cups are applied, which can be used for complicated geometries or as reference points for the positioning of the part. Within the actuators sensors are integrated which help to monitor the milling process and counteract possible process deviations.

A major difference to existing solutions is the strong integration with process-specific software packages. A context-based process model simplifies communication between manufacturing and engineering departments. Another software package optimizes the positioning of the actuators based on the CAD-data of the specific part. Furthermore, using FEM-based simulation developed at the FIBRE, the variation of process-induced stresses during the milling as well as the forces acting at the suction cups is simulated. This simulation allows the user to harmonize the design of the part, the milling process and the clamping tool with each other.



Flexible clamping tool

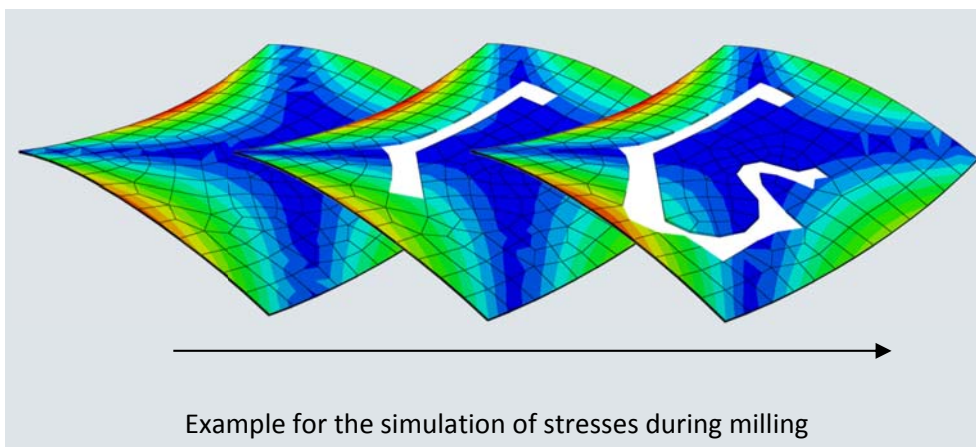
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### Possible Applications

Especially for small- and medium sized production batches, as they are found in many aerospace applications, the milling of parts on part-specific clamping tools is inefficient. Using the flexible clamping and positioning tool developed within this project, production costs can be significantly decreased, lead times can be reduced and shop floor can be saved.



### Contact Person

Tim Frerich, M.Sc. · Telephone: +49 (0)421 218 596 52 · frerich@faserinstitut.de

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### Project Partners

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- Faserinstitut Bremen e.V., Bremen

### Faserinstitut Bremen e.V.

The Faserinstitut Bremen e. V. is active in research and development tasks in areas of testing, development and processing of fibres, textile preforms and carbon fiber reinforced plastics. [The department of Composite Structures and Processes](#) focuses on the examination of continuous process chains and the design of components for aircraft and automotive industry and other industrial fields.

Faserinstitut Bremen e.V. · Am Biologischen Garten 2 (IW3) · 28359 Bremen · Germany  
Telefon +49 (0)421 218 587 00 · Telefax +49 (0)421 218 587 10 · [www.faserinstitut.de](http://www.faserinstitut.de)