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17.01.2019

Project Title:	Fabric-based multi-axial laminates optimised for waste cutting **Woven-PlusX**
Duration:	05/2018 – 04 2020
Funder:	AiF

Scientific-technical problem

Due to the good drapability, woven fabrics are mainly used for medium to heavily curved components made of fibre reinforced composites. To increase the overall stability and balance of the property profile across the load angle ± 45° fibre layers are often integrated into the fabric composite. However, the insertion of the ±45° position results in additional costs as a result of the necessary work steps for cutting and However, the insertion of the ±45° position results in additional Costs as a result of the necessary work steps for cutting and handling and as a result of the resulting waste (approx. 25 %, Fig. 1). Approaches existing in research to produce fabrics with additional fiber directions are however too unproductive or strongly restricted with regard to the production width. A new approach based on Open Reed Weaving technology was developed at ITA. By carefully selecting yarn paths, overlaps can be created between two yarn systems within a fabric or between two fabrics stacked on top of each other. This allows a fabric-based multi-axial laminate to be produced with significantly reduced waste (by 30-90%) and 33% reduced manufacturing effort (see Figure 1).

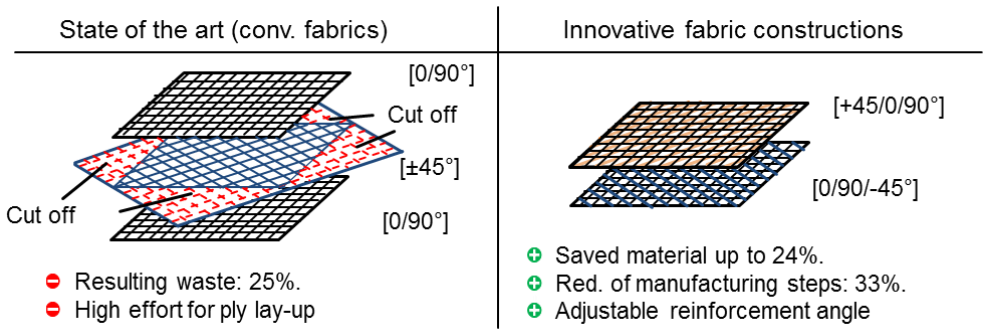

Figure 1: Savings potential through newly developed approach

The approach (see Figure 2) has already been proven in preliminary tests for the generation of a third load-bearing fabric direction. With the currently

available knowledge, however, an industrial implementation is not yet possible. There is a lack of in-depth knowledge of the weave design, process control, further processing and component design based on such multiaxial fabrics.

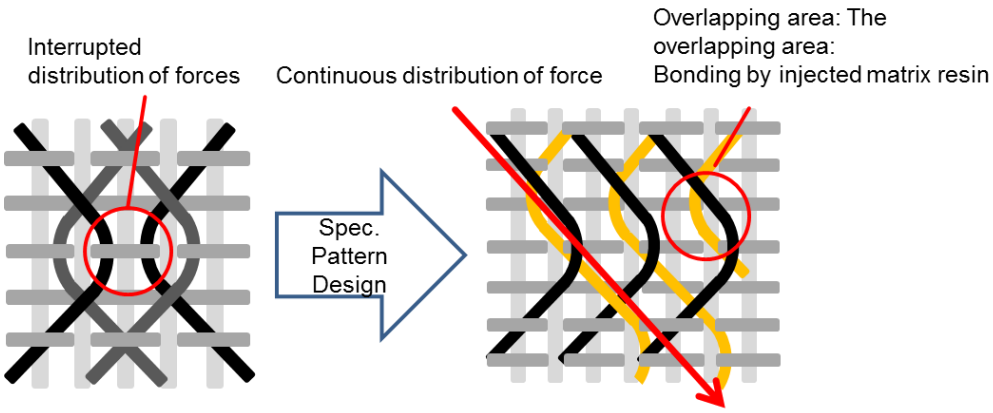

Figure 2: Principle of overlapping to generate the force transmission

Main goal of the project is to utilise these innovative textile structures for industrial applications. A design guideline for multi-axial laminates based on the developed fabric structures will be developed for this purpose. In particular, this includes concept selection for multi-axial laminates based on application requirements, characteristic values for laminate design, rules for designing fabric patterns, comprehensive collection, material properties relevant for further processing and knowledge of economic efficiency. Furthermore, suitable processes are developed to produce fabric structures and for the positioning of the layers in relation to each other during further processing. The development results thus open the possibility for companies to use the newly developed textile structures for significant cost reduction in preforming as well as for the expansion of the existing product range.

Acknowledgment

The research project 20148 N of the AiF Projekt GmbH, Berlin is supported within the framework of the Forschungskuratorium Textil e.V. (Textile Research Board) of the German Federal Ministry of economy and energy based on a decision of the German Bundestag.

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