Institut für Textiltechnik und Lehrstuhl für Textilmaschinenbau
RWTH AACHEN UNIVERSITY

Univ.-Prof.
Prof. h.c. (MGU)
Dr.-Ing. Dipl.-Wirt. Ing.
Thomas Gries
Direktor

Schlesinger Yanick
Wissenschaftlicher Mitarbeiter

Mein Zeichen: YS
02.12.2020

Projekttitel:	Woven-plusX
Thema:	Low-waste multi-axial laminates on fabric basis
Laufzeit:	05/2018 - 04/2020
Förderträger:	AiF
Förderkennzeichen:	20148 N
Projektträger:	Federal Ministry for Economic Affairs and Energy (BMWI)

Due to their good draping properties, mainly fabrics are used for medium to highly curved components made of fiber reinforced composites. To increase the general stability and balance of the property profile over the load angle, ±45° fiber layers are often inserted into the fabric composite. However, the insertion of ±45° layers results in additional costs due to the necessary work steps for cutting and handling as well as the resulting waste (approx. 25%, Fig. 1). In scientific research, there are approaches for the production of multiaxial fabrics. However, these approaches show deficits with regard to the realizable production width and productivity. At ITA a new approach based on the Open Reed Weaving technology was developed. By means of specifically selected yarn traverses, overlaps between two yarn systems within a fabric or between two fabrics stacked on top of each other can be created. In this way, a fabric-based multiaxial laminate can be realized with a greatly reduced waste (by 30-90%) and a 33% reduction in making-up effort.

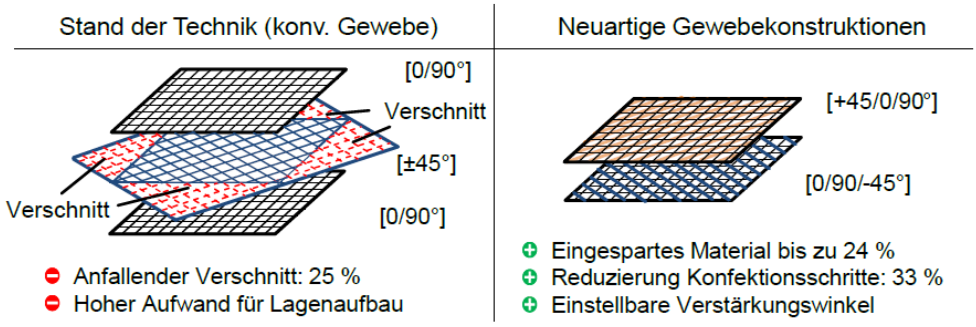

Abb. 1 Summary State of the art and project goal

Aim of the project

The central aim of the project is to reduce the preforming costs for multi-axial laminates by using innovative fabric constructions in the open read weaving process and to make this technology usable for industrial applications.

Results

First of all, process limits were determined with regard to the patterning possibilities in open reed weaving. The results in the form of angle tables provide a comprehensive overview of the production-related boundary conditions in open reed weaving and are used for the design of multiaxial weave constructions in general. On this basis, three design approaches for force transmission in multiaxial fabrics outside the warp and weft direction were developed. The semi-finished products were first laid out theoretically, the weave was developed and then implemented in the weaving process. Subsequently, the semi-finished products were mechanically characterized. This showed that the principle of force transmission between two fabric layers in a composite by overlapping fiber bundles works in principle and that the mechanical properties with regard to tensile and compressive strength and stiffness correspond to the level of a continuous fiber reinforcement. The main result of the project was to show that this type of multiaxial fabric is technically applicable for structural mechanical applications. The knowledge gained with regard to the development of the weave was transferred into a guideline for weave design and programming. Potential fields of application for multiaxial fabrics were identified and compared with conventional fabrics in the course of an economic evaluation. The main areas of application are those in which large, slightly curved (shell) components are used.

Acknowledgement

The IGF project no. 20148 N of the Forschungsvereinigung Forschungskuratorium Textil e.V., Reinhardtstraße 14-16, 10117 Berlin was funded via the AiF within the framework of the program for the promotion of joint industrial research (IGF) by the Federal Ministry of Economics and Energy based on a resolution of the German Bundestag.

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages

Contact
Yanick Schlesinger, M.Sc.
Institut für Textiltechnik of RWTH Aachen University
Tel.: +49 241 80 23457
E-Mail: yanick.schlesinger@ita.rwth-aachen.de