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Project title: TailCo: Fibre composite structures based on tailor-made reinforcement products

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Abstract

Preforming, in other words, the cutting and assembly of the dry fibre preform for the insertion into the impregnating mould, is the main cost driver in the production of components from fibre-reinforced plastics (FRP), accounting for approximately 50% of the costs. The main reasons for this are the large number of necessary process steps as well as high blending quantities of often 40-50 % at high material costs. In this context, textiles with already integrated local reinforcements, so-called tailored textiles, have a high potential to increase cost efficiency in preforming. The possibility of integrating load-path-orientated reinforcements also allows the lightweight construction potential to be better exploited. Both additive processes, such as tailored fiber placement and integrated processes can be used to manufacture tailored textiles. An integrated processes is a continuous production of a flat basistextile (e.g. fabric or NCF), in which local reinforcements are integrated simultaneously. While there are already approaches for additive processes to design components suitable for production, such methods for integrated processes have so far been completely lacking. In contrast to additives processes, integrated processes require significantly more attention to textile-technological boundary conditions, which makes the design much more complex. Therefore, suitable design methods are necessary to harness the great potential of integrated tailored textile processes.

Within the framework of the completed IGF project "Multiax-Structure" and in Lenz's dissertation, an interdisciplinary approach for the holistic modification of the product development process (PEP) of FRP components was developed. In addition, this work enabled a systematic integration of tailored textiles into conventional PEP, which was validated by an example component to show the applicability. In the course of the example design, it was also

possible to demonstrate the fundamental weight and cost saving potential. In order to estimate the actual innovation potential of tailored textiles, however, extensive investigations are still required with regard to the achievable economic efficiency for various applications. To carry out these investigations, the developed concept for modifying the PEP must still be converted into a robustly applicable design method.

Firstly, a basic model of a construction method will be deduced from the previously developed PEP concept. Then, the individual modules will be developed within the design process: preliminary component design, technology pre-selection, production-oriented component design, detail design and production planning. The design of the construction method and the individual modules will be tested with sample components simultaneously. As a result, improvement actions can be derived. Moreover, the considered production scenarios will be varied in a sensitivity analysis in order to gain a more general understanding of the achievable savings potentials. Finally, a software tool will be developed that supports the actors, which are involved in the PEP (design engineer, structural mechanic and producer) in the exchange of information and in the individual steps.

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