Institut für Textiltechnik und Lehrstuhl für Textilmaschinenbau
ITA
RWTH AACHEN UNIVERSITY

Project title:	Development of multiaxial non-crimp fabrics made from recycled carbon fibres - CarboReFab
Partner:	Institut für Textiltechnik of RWTH Aachen University Institut für Textiltechnik Augsburg gGmbH
Duration:	12/2020 – 11/2022
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Univ.-Prof.
Prof. h.c. (MGU)
Dr.-Ing. Dipl.-Wirt. Ing.
Thomas Gries
Director

Carsten Uthemann
Research Associate

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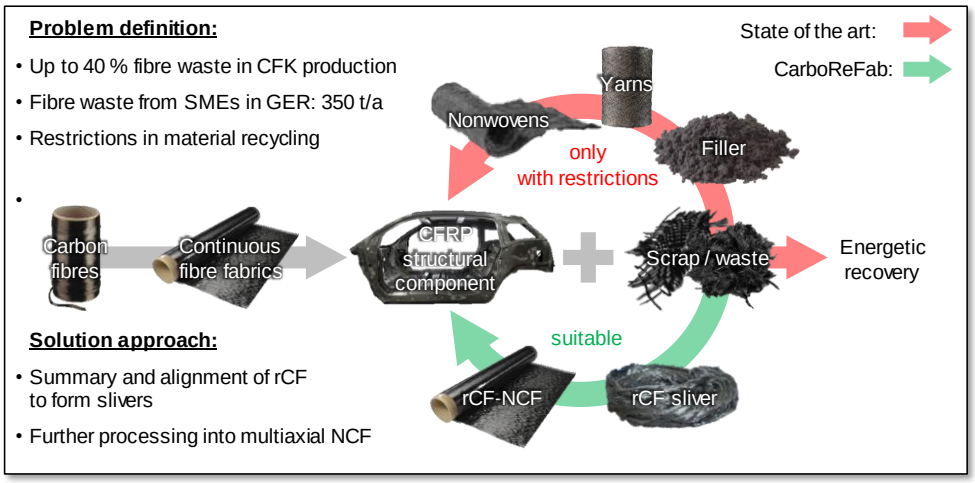
Mission Statement

The recycling of production-related carbon fibre waste is an economically and ecologically essential requirement for increasing the resource efficiency of carbon fibre reinforced plastics (CFRP). The retention of value of the recycled carbon fibres (rCF) is of crucial importance. Currently, rCF is mainly processed into filler material for injection moulding applications or into nonwovens. Due to the low achievable mechanical properties, these approaches are only of limited suitability for the use in structural lightweight construction. The aim of the project CarboReFab is therefore to provide the necessary conditions for the use of rCF in structural lightweight construction. The solution approach is the development of a multiaxial non-crimp fabric (NCF) made of highly oriented rCF slivers. Compared to nonwovens, the use of NCF allows significantly higher fibre orientations and fibre volume contents in the composite component. 85 % of the tensile strength and 95 % of the tensile modulus of a continuous fibre reinforcement are therefore aimed for. The semi-finished product costs are to be approx. 20 % lower than those of a primary fibre semi-finished product.



Objectives:

- 85 % of tensile strength and 95 % of tensile modulus of CFRP with continuous fibre NCF
- 80 % of the cost of continuous fibre NCF
- Provision of material data sheets
- Proof of performance based on use cases

Economic relevance for SMEs:

- Reduction of financial losses:
  416 k €/a through sale of rCF (80 t/a)
- Increase in turnover:
  640 k €/a through sale of rCF sliver (195 t/a)
  1,48 mio. €/a through sale of rCF NCF (195 t/a)

The project addresses the following research issues:

- What is the influence of the rCF properties on the manufacturing processes?
- How has the process for rCF sliver production to be adapted?
- How has the process for NCF production to be adapted?
- Which composite properties can be achieved with rCF-NCF?
- What influence does the rCF properties have on the composite properties?
- In which application areas can the rCF-NCF be used?
- How can constant properties be guaranteed?

Approach

1. Adaptation of the processing concepts, implementation and validation

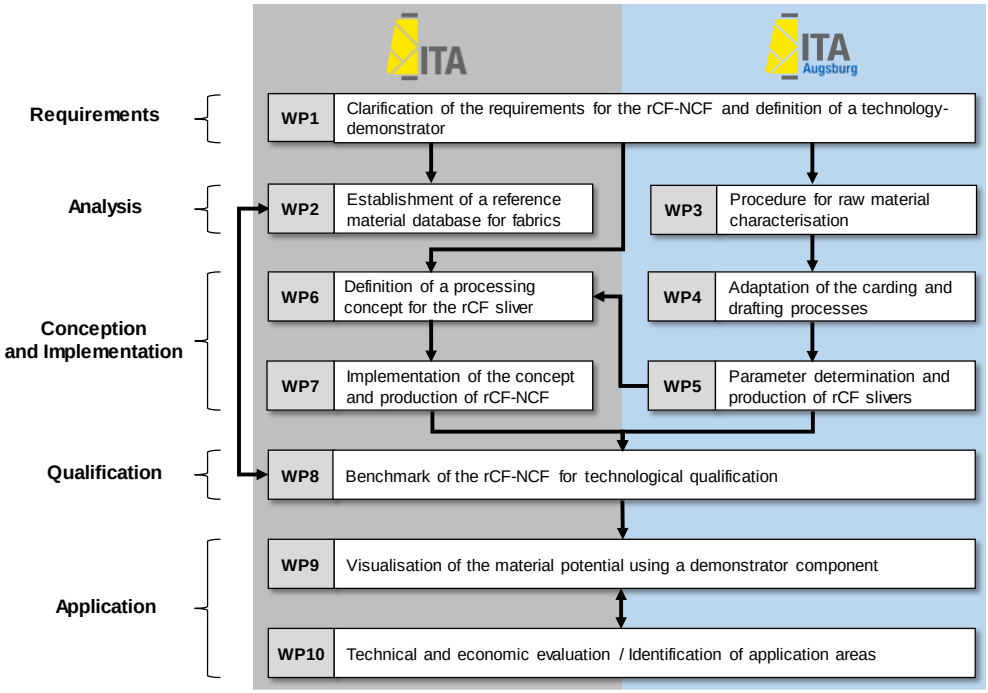
The requirements along the value chain are determined and transferred into processing concepts. Based on methodical approaches, these are implemented and validated.

2. Material analysis and qualification of the new rCF-NCF

For the qualification of the novel fabrics, a material map will be established, which contains the most important processing and composite properties of available rCF fabrics. For this purpose, extensive material analyses are carried out and combined with the results of past research projects.

3. Evaluation of the application potential of the new rCF-NCF

On the basis of the implemented process chain, the results of the material analysis as well as prototypically produced demonstrator components, a technical-economic evaluation of the new fabric is performed.



Acknowledgement

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Contact

Carsten Uthemann, M.Sc.

Tel.: +49 (0) 241 80 23 486

Mail: carsten.uthemann@ita.rwth-aachen.de