

Project title: HyPer-Organo - Development of an ultra-thin high-performance organic sheet for series components

Partner: SKL Schwergewebe Konfektion Lichtenstein GmbH, Oberlungwitz

Duration: 12/2018 - 11/2020

Funding Agency: Central Innovation Programme for SMEs (ZIM)

Univ.-Prof.

Prof. h.c. (Moscow State Univ.)

Dr.-Ing. Dipl.-Wirt. Ing.

Thomas Gries

Director

Carsten Uthemann

Researcher

Deficit

Thermoplastic fibre-reinforced plastics (T-FRP) have a high application potential due to their advantageous processability in hot forming processes, the associated short cycle times and the combinability with other materials. For the production of T-FRP components pre-impregnated textile semi-finished products (organic sheets) are currently predominantly used. During the production of components, these organic sheets are hot pressed into the component shape. The pressing process enables very short cycle times (< 3 min). Despite this advantage, series production of T-FRP components is currently hardly in use. The reason for this lies in the high prices for organic sheets, which result from unproductive manufacturing processes or high waste rates due to defective reinforcement fabrics.

Ref.: CU

01.02.2019

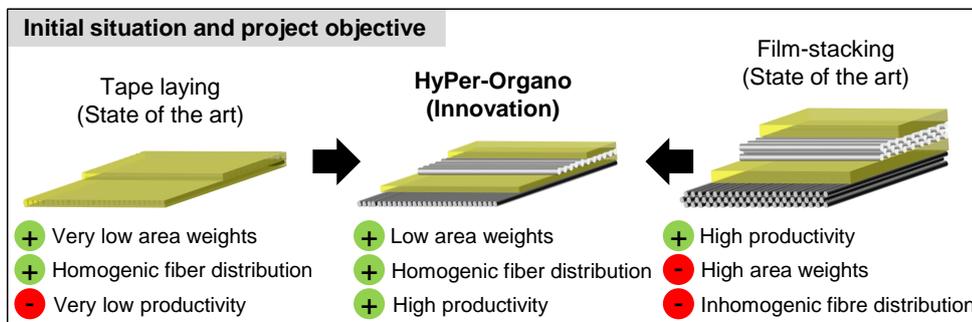
One approach to increase productivity is the production of organic sheets based on hybrid non-crimp fabrics. When processing glass fibres, however, the fabric process is currently restricted with regard to the minimum area weights that can be produced (min. 200 g/m²). This presents a major disadvantage, since the layer area weight has a significant influence on the mechanical properties of the component. Tensile strength, compressive strength, flexural strength and durability generally increase significantly with decreasing area weight. Single-layer area weights of 100-150 g/m² are therefore required for the production of high-performance components.

Objective

The objective of the project is the development of a high-performance organic sheet (HyPer-Organo) based on hybrid non-crimp fabrics with very low layer area weights. The fiber layers are characterized by a very homogenic fiber distribution. This enables very short pressing times (cycle time < 2 min) during further processing or component manufacture. In addition, an increase in mechanical properties (e.g. increase in bending strength by > 5 %) is aimed at through higher fiber volume contents and an improved fiber-matrix interfacial bond. The new process also offers very high flexibility due to the possibility of producing tailor-made fabric layers.

Approach

On the basis of the conventional non-crimp fabric process, a new fiber placement system is being developed for the production of the high-performance organic sheet. This deposition system consists of an online spreading device for producing very thin fiber layers and a novel device for fixing these layers. The combination of these modules enables the production of glass fiber fabrics with single-layer basis weights of 100-150 g/m² while simultaneously ensuring a homogeneous fiber distribution. The online spreading device is being developed by the Institut für Textiltechnik (ITA) of RWTH Aachen University. The fibre fixation is being developed by SKL Schwergewebe Konfektion Lichtenstein GmbH, Oberlungwitz. In addition, the production process is complemented by an online quality assurance system for quality data acquisition of the thin fiber layers.



Acknowledgements

We would like to thank the Federal Ministry for Economic Affairs and Energy (BMWi) for funding the research project as part of the Central Innovation Programme for SMEs (ZIM).

Contact

Carsten Uthemann, M.Sc.

Institut für Textiltechnik of RWTH Aachen University

Composite Reinforcements

Otto-Blumenthal-Str. 1, 52074 Aachen

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

Fax: +49 (0) 241 80 22 422

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