FASERINSTITUT FIBRE BREMEN

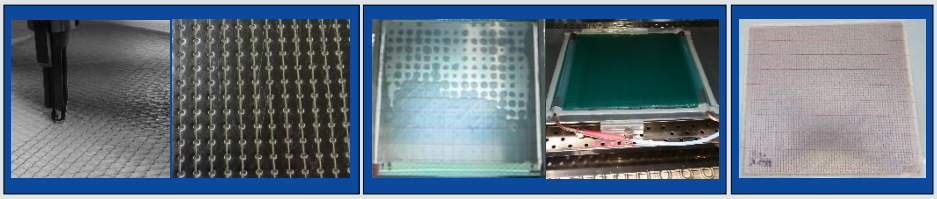
PROJECTS

FibMet

Development of Fibre Metal Laminates made of hybrid textiles

Objectives and Motivation

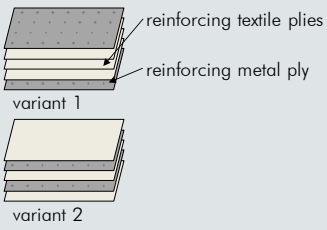
Fibre Metal Laminates (FML) are applicated in industrial products, especially in aerospace industries, because of the to be expected high mechanical performance. The research project aims for developing a procedure for economic manufacturing of FML. In this way, FML can also be placed in cost sensitive sectors like the automotive industry. Verifying, that FML can be manufactured by using infusion technologies is one of the objectives of this project. Therefore the fibre and metal layers are connected by sewing during a preproduction process. The influence of introduced metal sheets on the infusion process and the adaptation and optimisation of the chosen manufacturing strategy is another objective.



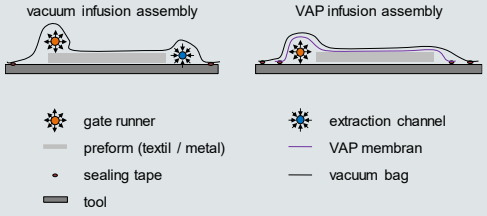
Textile pre-fabrication | Infusion | Curing

Approaches

To characterise the textile manufacturing process, various sewing parameters are used to bond the layers. The influence of these varying sewing schema, which is defined on the perforatio's dimension and spacing in the metal sheets, on the draping and impregnating behavior of the fibre metal preforms are analysed. The detailed structure of the FML is based on the requirements according to the application area. Two different layups, one with alterning textile and metal sheets and the other with the textile sheets sandwiched between the metal sheets, are tested.



Position of the perforated reinforcing metal ply in the laminate



Infusion strategies to be used [L. Müller (FIBRE), 2016]

For the production of FML, different infusion strategies, i. a. a conventional vacuum infusion assembly and an infusion assembly using a semi-permeable membrane (VAP infusion) are tested to optimize both the part quality (delamination, pores, local fibre volume fraction) and the manufacturing rate (infusion time). Also the influence of the integrated metal layers on the thermal curing process is investigated during the researches.

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During the characterisation of the laminate properties the quality of the infusion process and the mechanical properties are to be defined. The quality of the infusion process is defined by the laminate quality, the fibre volume fraction and the impregnation properties. The mechanical tests will provide clarification about the shear strength, resistance to pullout, Young's modulus and bending stiffness and the impact resistance of the material. All properties of the developed materials should be considered with regards to the influence of the metal layers and the applied perforation scheme.

Potential Applications

The textile industry companies involved can convert the generated results into new products in the medium term and include FML semifinished products in their product portfolio.

The puncture-resistant and light fibre metal laminates can be used in various areas, for example in box bodies of closed trucks or for air cargo containers. The aim is to use the FML components without changing the existing process sequences at the manufacturers.

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Project specific SME Users Group

• Bünker Textil GbR, Emsdetten • c-m-p GmbH, Heinsberg • Ing. Büro Lang GbR, Dollern • PalNet GmbH, Wiesbaum • P-D Aircraft Interior GmbH, Bitterfeld-Wolfen • SGL Kümpers GmbH & Co. KG, Lathen • TARTLER GmbH, Michelstadt • TEG Textile Expert Germany GmbH, Lengenfeld •

Faserinstitut Bremen e.V.

The Faserinstitut Bremen e.V. (FIBRE) is a scientific institute situated on the campus of the University of Bremen with more than 60 years experience in the fields of characterisation, development and processing of technical fibres and fibre based composites. The development of new processes, increased material efficiency, reduction of cycle times and testing of new lightweight construction concepts are part of the research activities in the department of Composite Design and Manufacturing Technologies.

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