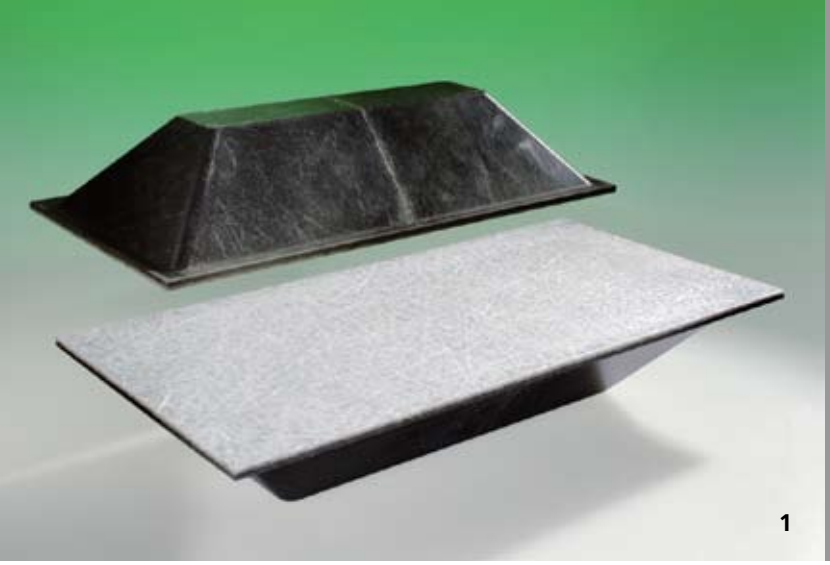
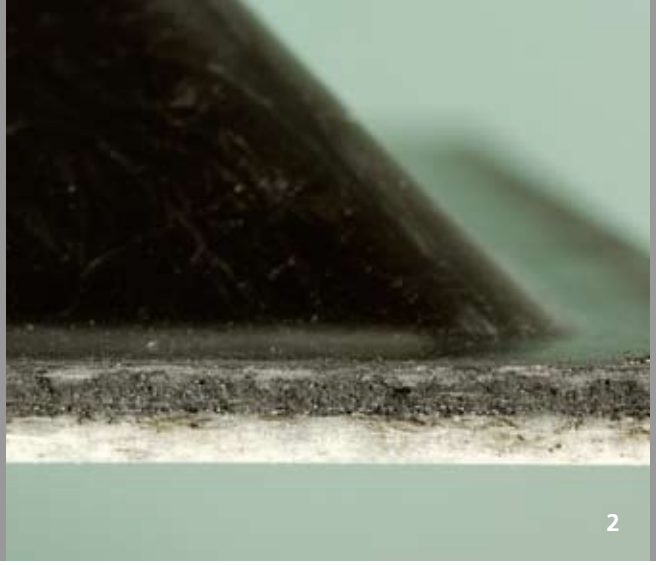


1



2

PROCESS CHAIN FOR THE PRODUCTION OF FRP LIGHTWEIGHT COMPONENTS

Task

Saving both raw materials and energy in production while simultaneously improving efficiency is becoming an increasingly important challenge for the automobile industry. Innovative lightweight construction concepts based on fiber reinforced thermoplastics (FRP) can make a significant contribution to this. However, before FRP components can be employed economically, production costs and time have to be reduced significantly while a component's complexity increases, all in order to meet the industry's functional requirements.

Method

This approach aims at developing an innovative process chain with a low number of process steps. This chain should enable fast and automated production of structural components made of long fiber reinforced thermoplastics which have a high potential for use in lightweight construction. The main idea underlying this approach is the manufacture of three-dimensional FRP raw components produced by a fiber spraying method for generating tractable preforms with adjustable fiber orientation. Afterwards, these preforms are consolidated in a variothermic tool and completed by laser cutting and laser welding to create a finished component. A CO_2 laser is used to trim the component; a diode laser to join the preforms.

Result

The process chain improves the lightweight potential and suitability for mass production while reducing cycle time to less than three minutes, a significant advance. Through the further development of the classic laser method, the thermal damage zone during laser cutting can be reduced considerably and thermoplastic FRP can be welded.

Applications

The reduction of process steps will give the manufacturing and supplier industry new impetus to manufacture lightweight products with significantly reduced costs. For the automotive industry in particular, which is increasingly focusing on lightweight components, new opportunities are opened up for the production of sustainable lightweight components.

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1 Demonstration part of the process chain.

2 Joint bond and cut edge.