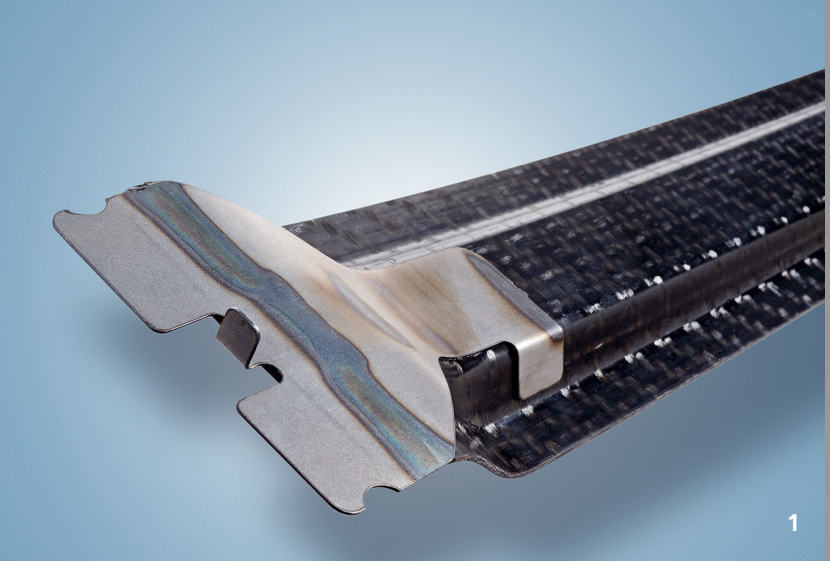

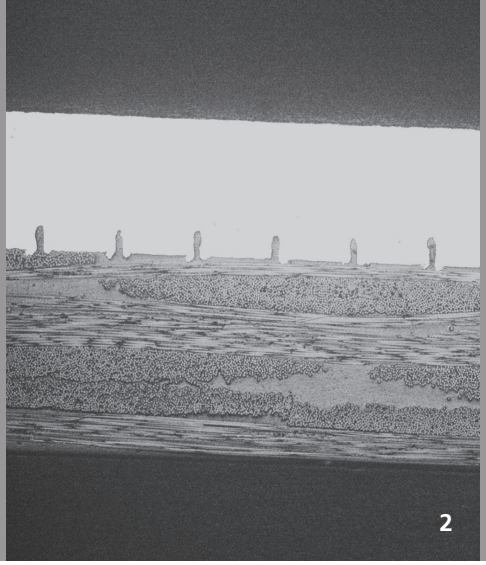

FULLY AUTOMATED PRODUCTION CELL TO MANUFACTURE HYBRID COMPONENTS

Task

Hybrid components play a crucial role in reducing vehicle weight as they allow the potential of all materials used to be fully exploited. Fiber-reinforced thermoplastics (TP-FRP) are particularly suitable for multi-material construction with metal as they provide excellent mechanical properties and good corrosion resistance. For this hybrid compound, however, no suitable joining method is currently available, one which en-sures a high quality connection without additional materials and, at the same time, is sufficiently automated for high volume production. To close this gap, Fraunhofer ILT has developed, among with nine other partners in the European »FlexHyJoin« project, a fully automated production cell for the production of hybrid components.

Method

By means of laser-based surface structuring, a positive connection and, thus, an optimized adhesion for hybrid components can be generated without any additional materials, such as adhesives. The combination of surface pre-treatment with induction and laser joining processes as well as the integration of all components in a fully automated production cell signifi-cantly reduce the cycle time.

1 Hybrid roof bow demonstrator.

2 Cross section of a hybrid joint, source: Institute for Composite Materials (IVW).

Results

Fraunhofer ILT has developed an efficient structuring process for the metal components of the roof bow demonstrator with a continuously emitting single-mode fiber laser for the produc-tion cell. For the production of the hybrid roof bow (material combination: Tepex® dynalite 102RG600 [PA6-GF] and DC04), all necessary components for the structuring process within the production cell have been constructed and integrated into the entire cell. Due to the curved shape of both of the side connection plates, a z-shifter was integrated into the scanning head. In the cell, the scanning head is positioned over the metal components with a robot, which are then structured linearly.

Applications

By developing a fully automated joining process for the rapid production of hybrid components based on metals and thermo-plastic fiber-reinforced composites, the »FlexHyJoin« project has developed a process to manufacture lightweight and rigid hybrid components in short cycle times. Thanks to the project's results, the use of hybrid components in automotive mass production can thus be advanced.

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