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Ref.: MS/DG
19.12.2018

Project title:	Development of a material- and load-path optimized TFP preform technology for the processing of multi-component mixed fibres in thermoplastic composites
Partner:	Digel Sticktech GmbH & Co. KG Steinhuder Werkzeug- u. Apparatebau Helmut Woelfl GmbH
Duration:	10/2018 – 09/2020
Funding Agency:	Central Innovation Programme for SMEs (ZIM) of the Federal Ministry for Economic Affairs and Energy

Mission Statement

Thermoplastic fibre reinforced plastics (FRP) are gaining increasing economic importance. Compared to thermoset FRP, thermoplastic FRP are suitable for large series applications in the automotive sector due to their short process times and low post-processing costs and enjoy the advantage of better recyclability.

The TFP embroidery process (TFP = Tailored Fibre Placement) is a preforming process with the highest fibre efficiency, in which the reinforcement fibres are placed in the load path with low waste (< 5 %). In addition, further fiber systems can be fed into the TFP process. This allows functionalization for thermoplastic composite components. This can significantly increase composite properties such as damping or impact behavior. In addition, electrically conductive functional fibres (copper wire) can also be supplied.

A challenge when processing these preforms into thermoplastic FRP is the high melt viscosity of such matrix systems. One way of reducing the flow paths and thus also the cycle time when processing these matrix systems is to use hybrid yarns. In hybrid yarns, the reinforcing fibers and thermoplastic filament yarns are already mixed at the filament level. This minimizes the flow paths of the thermoplastic matrix and ensures that the preforms can be processed cost-effectively into thermoplastic FVKs. The deficit in the use of conventional hybrid yarns lies in the limited choice of materials and the material structure which is not adapted to embroidery. This can lead to incomplete fibre impregnation during processing and thus to poor mechanical and optical properties of the subsequent fibre composite components. Therefore, the use of such thermoplastic FRP based on the TFP process in the visible range of automotive applications is not possible.

Approach

The aim of the OptiTFP development project is the development of a direct placement of reinforcing and thermoplastic fibres under the additional feeding of functional fibres in an inline mixing process during the TFP embroidery process. In addition, a tool with an active heating and cooling system is being developed for a high finishing quality of FRP produced from the TFP preforms. The central picture of the OptiTFP development project is shown in Figure 1.

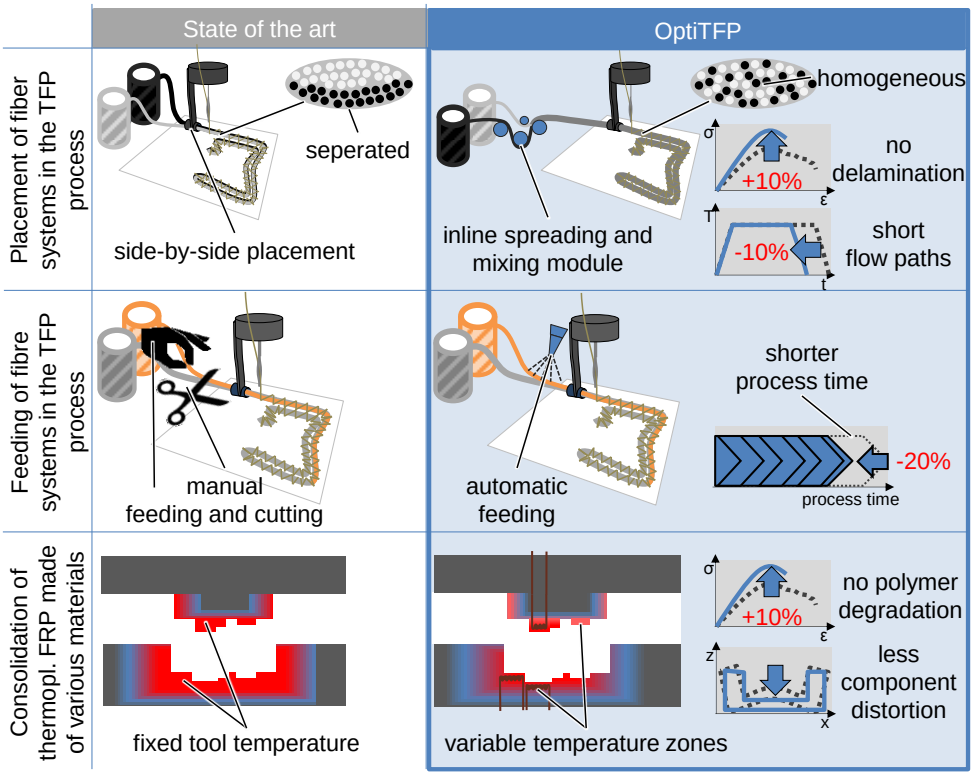

Figure 1: Central picture of the approach for the OptiTFP project

Acknowledgement

We would like to thank the Federal Ministry of Economic Affairs and Energy (BMWi) for the financial support of the research project "OptiTFP" within the framework of the Central Innovation Programme for SMEs (ZIM).

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