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DigitalTPC
DIGITAL TWIN FOR THERMOPLASTIC COMPOSITES TECHNOLOGY

Introduction

Digital twins of individual machines and systems already lead to significant increases in efficiency in industrial production and continuous operation, e.g. through improved production control and machine maintenance. However, their potential for value-added and material-triggered process control is still largely untapped. This applies in particular to the increasing series production of plastic-based composite lightweight structures.

Unidirectional continuous fiber reinforced thermoplastic tape (UD tape).

The digital twin for thermoplastic composites (digitalTPC) is intended to demonstrate this potential by means of the UD tape and hybrid injection molding technology. This technology is currently establishing itself on the market and is capable of large series production. Continuous fiber-reinforced thermoplastic composite (TPC) semi-finished products (UD tapes) are thermoformed and overmolded. In particular, the complex and heterogeneous microstructure of the composite material itself has a significant influence on the manufacturing process of semi-finished products and the structural components. This influence poses an enormous challenge for process control and quality assurance and requires the complete digitalization of the entire production process.

Objectives of Project

- Extended Digital Twin for complete value-added chain for manufacturing of lightweight thermoplastic composites structures
- Process integrated nondestructive cognitive sensors to extract material and processing data from all sub-steps
- Extended ontology based data analytics and link to continuous CAE simulation chain
- Individual quality assessment and self-adapting processing steps within the complete value-added chain

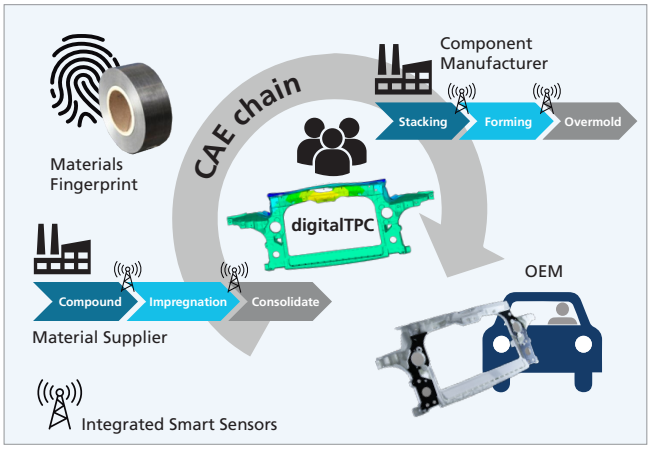
R&D APPROACH AND PARTNERS

R&D Approach

The project digitalTPC aims at the comprehensive and holistic consideration of all sub-process steps, partly taking place at different locations, from the semi-finished product to the component production.

With the help of suitable process-integrated and cognitive sensor technology, selected relevant material, process and component characteristics (e.g. fiber orientation, pore content, semi-finished product thickness) are to be measured and considered throughout the entire value-added chain.

Measured data will be linked to a continuous simulation chain across all process stages. Ontology based data analytics will provide feedback to processes and machines as part of the digital twin.



Value-added chain for lightweight thermoplastic composites parts considered in digitalTPC.

Contributions of Partners

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