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1 Process stages of a hybrid storage compartment flap made from thermoplastic UD tape (collaborative project involving the partners EDAG Engineering AG, Celanese – Engineered Materials and Fraunhofer ICT).

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THERMOPLASTIC TAPE PROCESSING

Key research topics

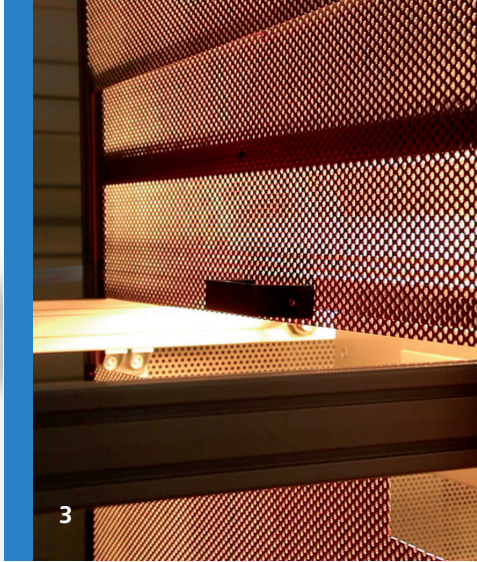
- Development of new tape-laying technologies to minimize cutting scrap and maximize material throughput
- Development of efficient technologies for consolidation
- Combination of established large-scale processes (injection molding, LFT-D compression molding) with local continuous-fiber reinforcement
- Thermoplastic one-shot sandwich solution with continuous-fiber-reinforced surface layers
- Holistic process chain assessment
- Feasibility studies on the production of prototype components
- Process-structure-property analysis in the context of the holistic materials-methods-process (MMP) approach

Production technology

- Fiberforge tape laying technology for fast and efficient tape laying
- Consolidation technologies based on hydraulic presses and radiation-induced vacuum consolidation (Fibercon)
- 6,300 kN and 36,000 kN presses with parallel positioning and LFT-D in-line compounding system
- 7,000 kN injection molding compounder
- 600 to 1,200 kN standard injection molding machines
- 7,000 kN and 5,500 kN injection molding machines with mucell technology and flexible manufacturing cell
- Robot systems with up to 250 kg maximum load
- Fully automated forming systems
- Heating technology
 - Infrared heating panel
 - Convection oven systems
 - Contact heating systems



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Automated tape laying

- Automated, rapid manufacturing of tape laminates
- Layup of tailored blanks with load-specific fiber orientation
- Freely-adjustable fiber orientation
- Ultrasonic spot welding to tack the tape plies
- Tailored blanks up to a diameter of 2 m
- Freely adjustable tape width (50 mm to 165 mm)
- Possibility of manufacturing hybrid tailored blanks with glass and carbon fiber reinforcement
- Variable wall thicknesses possible
- Almost any fiber matrix combination processible
- Angled cutting for scrap reduction

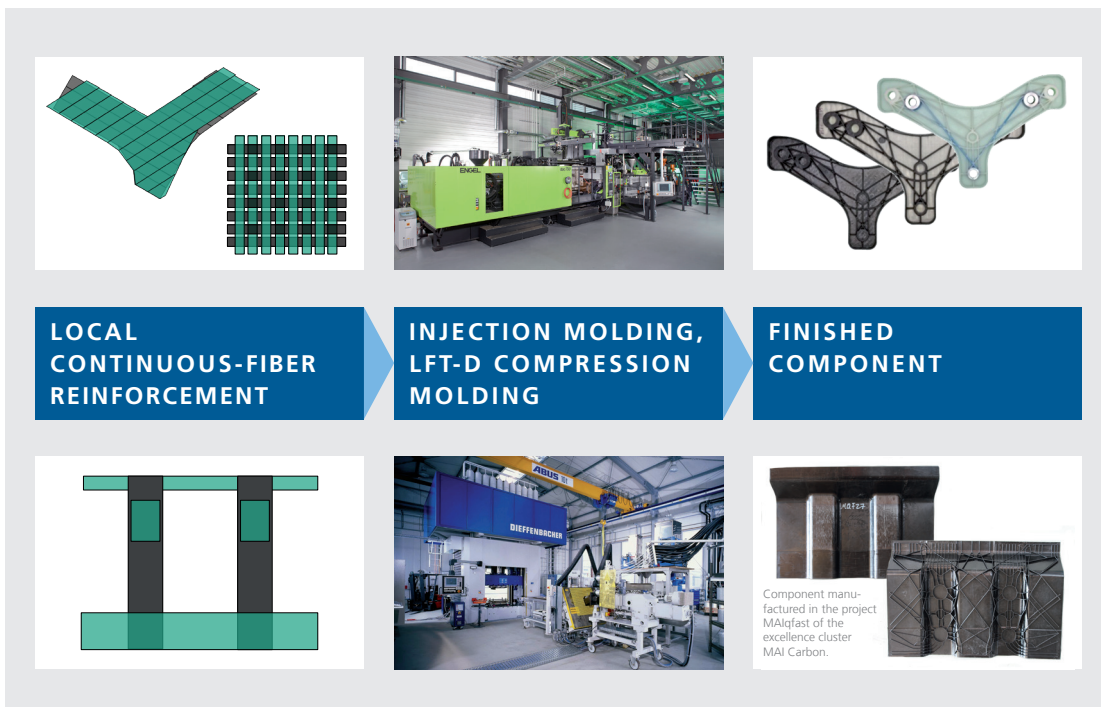
Consolidation methods

- Heat-transfer-press (HTP) process
- Quasi-isothermal consolidation
- Development of new methods for the consolidation of tailored blanks (including variable wall thickness)
- Radiation-induced vacuum consolidation (Fibercon)

Shaping and integration of functions

- Part prototyping – from UD tape to hybrid components
- Analysis and characterization of draping mechanisms during molding on coupon and component level

- Prediction and evaluation of shape deformations (spring-in and warpage)
- Characterization of interface properties of hybrid components
- Integration of functions in structures made from UD tape with short- or long-fiber-reinforced thermoplastics using injection molding and LFT-D compression molding (e.g. ribs, screw bosses, clips, etc.)
- Development of novel solutions for optimal load transmission in continuous-fiber-reinforced structures
- Intrinsic measurement of residual stresses



- 2 *Fiberforge tape laying technology.*
- 3 *Radiation induced vacuum consolidation.*
- 4 *Automated molding.*