

Optimising thermoplastic hybrid laminates: sustainable components for electric vehicles

About this project



RESOsafe

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Markets: 

Material: Thermoplastics, Steel, Basalt fibre-reinforced plastic

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Energy.

[Technology Transfer Program Leichtbau](#)

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Context

Modern lightweight structures must combine high mechanical performance and cost-effectiveness with a good environmental balance. These requirements are often in conflict, especially in safety-relevant vehicle structures: in order to safely dissipate crash energy, high-strength, hot-formed steels are often used today - with correspondingly high energy and resource requirements in production.

Hybrid laminates made of metal and continuous fibre-reinforced thermoplastics (FRP) offer an alternative. These multi-layer composites combine thin metal cover layers with a fibre-reinforced plastic core and thus achieve a high damage tolerance with low weight. Thermoplastic systems can also be processed more efficiently and offer advantages in terms of recycling and the carbon footprint. The researchers in the RESOsafe project are specifically developing this technology further and transferring it into a practical application for passive vehicle safety.

Purpose

The project team wants to further develop thermoplastic FRP/metal hybrid laminates so that they are suitable for large-scale production and crash-proof structures. To this end, it is trialling the technology under realistic industrial conditions.

The researchers are transferring the hybrid construction method to central components of an electric vehicle crash management system: cross members and crash boxes. They want to show that high crash requirements can be met with cost-effective, mass-compatible materials and more energy-efficient processes - while at the same time significantly reducing mass.

At the same time, the team is evaluating ecological effects over the entire life cycle and taking into account requirements for production, coating suitability and traceability in production. RESOsafe thus creates the basis for transferring hybrid laminates to other lightweight construction applications in various industries in the future.

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Procedure

The project team is developing an end-to-end process and component chain for crash-relevant hybrid structures. First of all, the researchers are designing a construction method that specifically combines metal and fibre composites. In doing so, they use locally different densities in the FRP core in order to specifically adjust the stiffness in the component.

The team then produces suitable thermoplastic semi-finished products and moulds with which the components can be manufactured reproducibly and in short cycle times. At the same time, it develops automation solutions for heating and transporting the FRP layers and stacking them precisely when they are warm and soft.

For quality assurance purposes, the participants characterise the hybrid laminates optically and mechanically and test them at component and system level in near-crash tests. In addition, they record quality-relevant process data for traceability and evaluate the environmental impact in comparison to established solutions in order to provide reliable evidence of technical, economic and ecological potential.

Funding duration:

Funding sign:

03LB3076

Funding amount:

EUR 1.7 million

Final report

Further websites

foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3076A - RESOsafe in the federal funding catalogue

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Project coordination

Contact:

Mr Dipl.-Ing. Ralf Proksch

+49 0371 334281-164

r.proksch@ersoma.de

Organisation:

ERMAFA Sondermaschinen und Anlagenbau GmbH

Otto Schmerbach- Straße 19
09117 Chemnitz
Saxony
Germany

www.ersoma.de



English (EN){ { Projektpartner } }



Oederaner Stanz- und Umformtechnik GmbH, Fischer GmbH, Technische Universität Chemnitz – Fakultät für Maschinenbau

Lightweighting classification

Realisation

Offer

Products

Parts and components, Machines and plants



Services & consulting

Engineering, Technology transfer



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Lightweighting classification	
	Realisation
Field of technology	
Design & layout Hybrid structures	✓
<i>Functional integration</i>	
<i>Measuring and testing technology</i>	
Modelling and simulation Optimisation, Processes, Structural mechanics	✓
<i>Plant construction & automation</i>	
<i>Recycling technologies</i>	
Manufacturing process	
<i>Additive manufacturing</i>	
<i>Coating (surface engineering)</i>	
Fibre composite technology Manual lamination	✓
Forming Compression moulding	✓
<i>Joining</i>	
<i>Material property alteration</i>	
<i>Primary forming</i>	
<i>Processing and separating</i>	
<i>Textile technology</i>	

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Lightweighting classification	
	Realisation
Material	
<i>Biogenic materials</i>	
<i>Cellular materials (foam materials)</i>	
Composites	✓
Basalt fibre-reinforced plastic	
<i>Fibres</i>	
<i>Functional materials</i>	
Metals	✓
Steel	
Plastics	✓
Thermoplastics	
<i>Structural ceramics</i>	
<i>(Technical) textiles</i>	