Sustainable protective structures for electric cars: fibre-reinforced plastics replace aluminium

About this project

protECOlight

Sustainable protective structures for electric cars: fibre-reinforced plastics replace aluminium

Markets:

Material: Glass fibres, Thermoset plastics, Thermoplastics, Glass-fiber reinforced plastics (GFRP)

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

Technology Transfer Program Leichtbau

Context

The requirements for vehicle construction are changing with the introduction of alternative drive systems such as battery and hydrogen technologies. Underbody structures in particular, which protect sensitive energy storage systems, must fulfil high safety standards and at the same time be designed to be more ecologically sustainable. Lightweight construction offers a decisive opportunity here to reduce weight and thus also energy consumption.

At the same time, the focus is on aspects such as the use of recycled and bio-based plastics and the development of efficient manufacturing processes. The aim is to develop components that enable better resource utilisation throughout the entire product life cycle and are suitable for series production.

Purpose

In the protECOlight research project, the team is developing sustainable, fibre composite-based lightweight protective structures for cars with alternative drive systems. The aim is to replace aluminium, the dominant material to date, with fibre-reinforced plastics. These reduce the weight of the protective structures by up to 30 per cent, which directly increases energy efficiency in electric and hydrogen vehicles.

The researchers also want to use recycled polypropylene and bio-based polyurethane to replace fossil resources. The components and processes developed should not only offer ecological advantages, but also fulfil the requirements of series production and cost efficiency in order to enable broad industrial application.

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Procedure

The project team is pursuing two approaches, tailored to different vehicle segments and volume scenarios. The researchers are developing a polyurethane sandwich structure for vehicles with a low number of units over their service life, e.g. the sports car segment. This consists of a long glass fibre-reinforced polyurethane foam core and cover layers made of continuous fibre-reinforced plastic. The innovative, single-stage manufacturing process saves material and energy.

For vehicle projects with a large production volume and a corresponding need for automation, the team relies on a different solution: here it combines glass fibre-reinforced polypropylene tapes with long fibre-reinforced thermoplastic moulding compounds to enable cost-efficient weight savings.

Alongside the material and process engineering developments, the researchers are carrying out a comprehensive life cycle analysis - from material selection to the near-series demonstrator. This enables them to make a sound assessment of the ecological and economic potential of the components. Innovative simulation methods also ensure the transferability of the solutions to industrial production.

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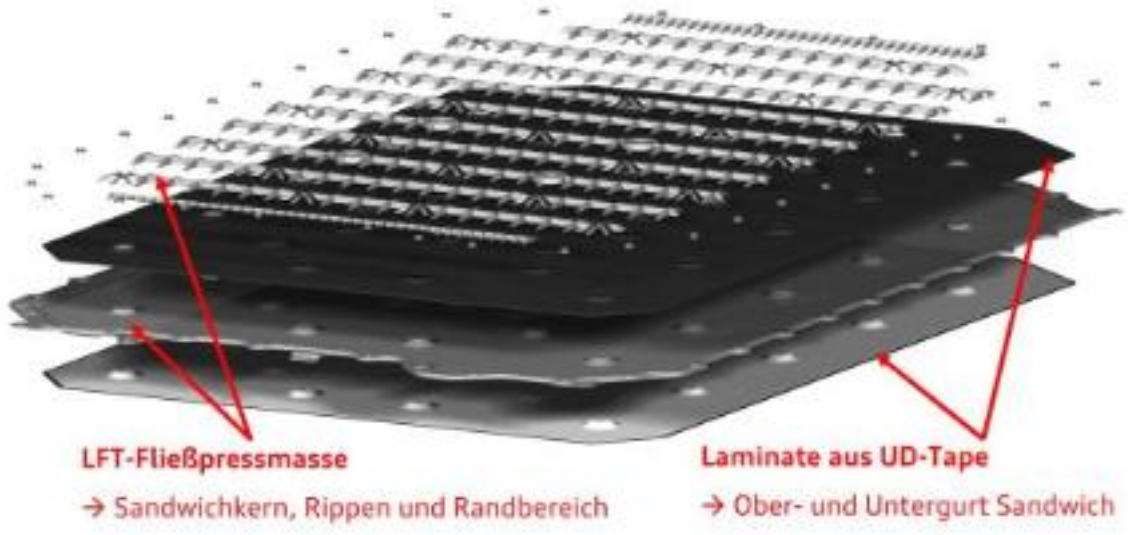

Funding duration:

Funding sign:	03LB3028	**Funding amount:**	EUR 1.8 million

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3028A - protECOlight in the federal funding catalogue

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Project coordination

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Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts	✓
Services & consulting Validation, Simulation	✓

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Hybrid structures	✓
Functional integration	
Measuring and testing technology	
Modelling and simulation Crash behaviour, Structural mechanics, Materials	✓
Plant construction & automation	
Recycling technologies Recycling	✓
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology Others (Thermoplastic and thermosetting moulding technology)	✓
Forming Impact extrusion, Compression moulding	✓
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites Glass-fiber reinforced plastics (GFRP)	✓
Fibres Glass fibres	✓
Functional materials	
Metals	
Plastics Thermoset plastics, Thermoplastics	✓
Structural ceramics	
(Technical) textiles	