Sustainable thermoforming: Recycled fibres make lightweight components more efficient and stable

About this project

ProMeTheuS

Sustainable thermoforming: Recycled fibres make lightweight components more efficient and stable

Markets:

Material: Carbon fibres, Others (Recycled carbon fibres), Thermoplastics, Yarns, rovings, Nonwovens, mats, Carbon-fiber reinforced plastics (CFRP), Laminates

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

Technology Transfer Program Leichtbau

Context

Thermoforming is an established process for the cost-effective production of large plastic components. It is used in the bus and railway industry, caravan construction and commercial vehicles, among others. However, the technology has limitations, as unreinforced plastics are often not sufficiently stable for more demanding applications.

Further development of the process is necessary in order to also process fibre-reinforced plastics and increase performance. An innovative approach has been developed here: Multilayer composite semi-finished products that contain recycled carbon fibres. This combination of materials offers promising potential for sustainable and high-performance components.

Purpose

The ProMeTheuS project aims to sustainably reduce CO2 emissions in the mobility sector. The project team is developing lightweight, stable and fully recyclable plastic components for mobile applications. The researchers not only want to use less material, but also utilise recyclable materials that can be recycled multiple times. They are developing recycled carbon fibre fleece for these multilayer composite semi-finished products.

ProMeTheuS is thus making a contribution to the circular economy by integrating recycled materials into high-quality applications and thus reducing the use of new resources. Through sustainable production processes, the project team also aims to significantly reduce CO2 emissions during the manufacture of the components.

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Procedure

At the start of the project, the team analysed the specific requirements of the bus and rail transport, caravanning and agricultural machinery industries. After a long development process, the researchers are working on a universal semi-finished product that can fulfil the relevant requirements of the industries during further development. Although the new materials are characterised by high strength and rigidity, these are not sufficient to replace the metal structure of a seat. The material could be used as a simple cover without high strength requirements in the specified industries. A simple component geometry is essential for successful deep drawing.

An important component of the project is the use of carbon fibre nonwovens, which achieve a strong reinforcing effect. After a long process of developing the material formulation, the potential of this technology and the appropriate component application became apparent. The researchers are developing a prototype that could lead to a lightweight, stable and resource-saving seating system for public transport in the future that is also recyclable. Traditional components such as wall panels and moulded elements are also being evaluated with the new semi-finished products, which underlines the versatility and future viability of the technology.

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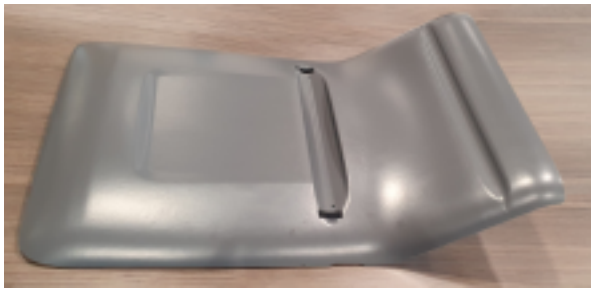

Funding duration:

Funding sign:	03LB2016	**Funding amount:**	EUR 1.8 million

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2016A - ProMeTheuS in the federal funding catalogue

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Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts, Systems and end products, Materials, Tools and moulds	✓
Services & consulting Testing and trials, Engineering, Prototyping, Simulation	✓
Field of technology	
Design & layout Lightweight manufacturing, Lightweight design, Lightweight construction concepts	✓
Functional integration	
Measuring and testing technology Component and part analysis, Visual analysis (e.g. microscopy, metallography), Environmental simulation, Materials analysis, Destructive analysis, Non-destructive analysis	✓
Modelling and simulation Loads & stress, Optimisation, Materials	✓
Plant construction & automation	
Recycling technologies Downcycling	✓

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Lightweighting classification

	Realisation
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming Thermal converting, Deep-drawing	✓
Joining Welding, Others (Co-consolidation)	✓
Material property alteration Others (Addition of additives (fire protection))	✓
Primary forming Extrusion	✓
Processing and separating Drilling, Milling	✓
Textile technology Nonwoven & mats production	✓

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites Carbon-fiber reinforced plastics (CFRP), Laminates	✓
Fibres Carbon fibres, Others (Recycled carbon fibres)	✓
Functional materials	
Metals	
Plastics Thermoplastics	✓
Structural ceramics	
(Technical) textiles Yarns, rovings, Nonwovens, mats	✓