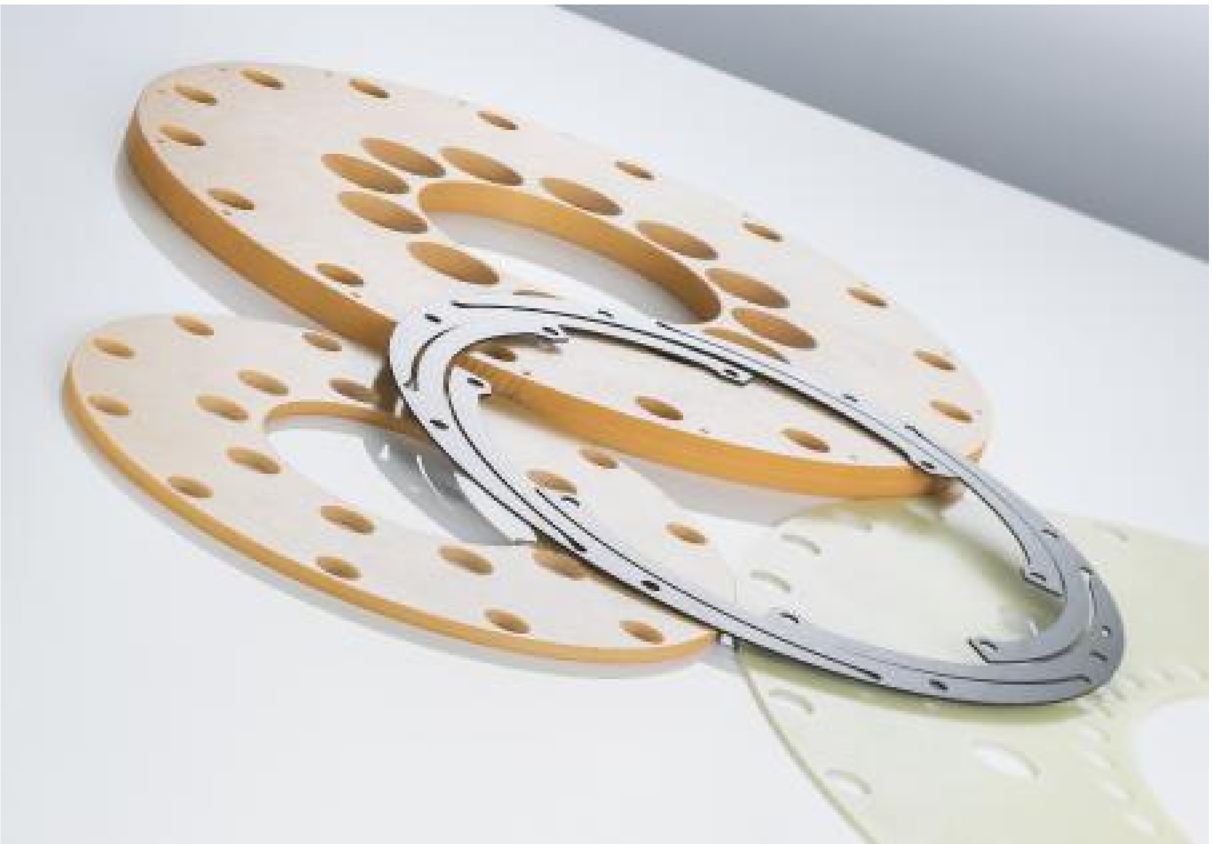
More durable components: Hybridisation makes fibre composite plastics more resilient

About this project



DurableHybrid

More durable components: Hybridisation makes fibre composite plastics more resilient

Markets:

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

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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

Fibre-reinforced plastics (FRP) have established themselves as key materials in lightweight construction as they offer many advantages for various applications thanks to their mechanical properties and low specific weight. They are replacing metallic materials, particularly in the mobility and mechanical engineering sectors, where components have to withstand high dynamic loads. However, conventional FRP materials reach their limits when it comes to fatigue strength and service life. Material fatigue under dynamic loads often leads to shortened life cycles and increased failure rates, resulting in higher costs and a larger CO_2 footprint. To counteract this, the hybridisation of FRP is being investigated: The combination of different fibre types in one material makes it possible to specifically improve the properties. However, to date there has been a lack of standardised semi-finished products and application-ready methods - this is where the DurableHybrid research project comes in.

Purpose

The project team has set itself the goal of increasing the fatigue strength of dynamically loaded FRP components by 30 percent through hybridisation. Hybridisation is intended to improve the material properties without increasing the weight. These improvements should help to significantly reduce the carbon footprint of the components, as more durable materials need to be replaced less frequently, thereby reducing material consumption and emissions. The focus is on components subject to bending loads, such as leaf springs, which are used in numerous industries. In the long term, the scientists are aiming to provide standardised semi-finished products for hybrid FRPs. In this way, they want to enable companies to produce more durable and resource-efficient components cost-effectively.

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Procedure

The project team combines experimental research and simulation to develop hybrid FRPs. First, the researchers are investigating how different types of fibres can be combined in one material in order to achieve optimum material properties. They carry out tests to show how loads affect fatigue strength. At the same time, they are developing digital simulation models that precisely map the properties of the hybrid materials and facilitate the design process. The team uses the knowledge gained in this way to produce leaf spring prototypes and test them in real applications. The results are incorporated into a digital modular system that is intended to provide standardised recommendations for the use of hybrid materials in design.

Funding duration:

Funding sign:	03LB4002	**Funding amount:**	EUR 913 thousand

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB4002A - DurableHybrid in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

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Lightweighting classification

	Realisation
Offer	
Products Parts and components	✓
Services & consulting Consulting, Engineering	✓
Field of technology	
Design & layout Lightweight manufacturing, Hybrid structures	✓
Functional integration	
Measuring and testing technology	
Modelling and simulation	
Plant construction & automation Plant construction	✓
Recycling technologies	
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology Pre-preg processing	✓
Forming	
Joining	
Material property alteration	
Primary forming	
Processing and separating Drilling, Milling, Sawing	✓
Textile technology	

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Lightweighting classification

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