Bio-based plastics: manufacturing load-bearing components in a material-efficient way

About this project

COOPERATE

Bio-based plastics: manufacturing load-bearing components in a material-efficient way

Markets:

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

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

Technology Transfer Program Leichtbau

Bio-based plastics: manufacturing load-bearing components in a material-efficient way

About this project

Context

Manufacturers of technical consumer goods often use thermoplastics to produce stable and durable components. Glass fibre-reinforced polyamides are mainly used in applications subject to vibrations, such as power tools. However, these materials are based on fossil raw materials and cause high CO# emissions.

Bio-based plastics offer a more climate-friendly alternative, but often do not achieve the required load-bearing capacity. At the same time, lightweight construction creates further potential for reduction through targeted material savings. New methods and materials are needed to successfully combine the two: materials with customised properties and design processes that take into account both mechanical requirements and environmental goals. This is precisely where the COOPERATE research project comes in.

Purpose

The project team wants to reduce the CO# emissions of plastic components in series production by up to 75 per cent. To achieve this, it wants to replace conventional plastics with more climate-friendly alternatives. The partners are further developing bio-based materials and new design methods so that they can be used under real-life conditions - even where components are subject to strong vibrations or permanent loads. They combine this with simulation-based design methods.

In this way, they create resource-efficient and durable components that have a significantly better eco-balance compared to previous solutions. The results can be transferred to applications in automotive engineering and other industries.

Bio-based plastics: manufacturing load-bearing components in a material-efficient way

About this project

Procedure

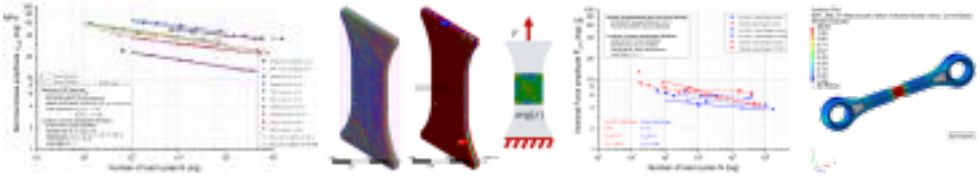
The project team is pursuing an integrated research approach: it is further developing bio-based composites, reinforcing them with fibres and analysing their behaviour in mechanically stressed applications. The researchers are not only investigating strength and vibration damping, but also ageing effects and optical quality.

At the same time, the partners are developing new simulation models that can be used to predict material behaviour under real conditions. These models form the basis for the development of lightweight structures that use as little material as possible. The researchers test the results in several stages - from small test specimens to real demonstrator components. Using a car chassis component as an example, they demonstrate the savings potential.

A life cycle analysis records the carbon footprint across all process steps. The team is also developing a manufacturing process suitable for series production that is designed for quality, short cycle times and structural use of the new materials.

Bio-based plastics: manufacturing load-bearing components in a material-efficient way

About this project



Funding duration:

Funding sign:	03LB3036	**Funding amount:**	EUR 1.7 million

Final report

Further websites

foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3036E - COOPERATE in the federal funding catalogue

www.lbf.fraunhofer.de/de/projekte/co2-reduzierte-bauteile-faserverstaerkte-biopolymeren-cooperate.html - Project website Fraunhofer LBF

Bio-based plastics: manufacturing load-bearing components in a material-efficient way

Project coordination

Contact:

Mr Georg Maximilian Stoll

+49 6151 705-8528

georg.stoll@lbf.fraunhofer.de

Organisation:

Fraunhofer Institute for Structural Durability and System Reliability LBF

Bartningstraße 47
64289 Darmstadt
Hesse
Germany

www.lbf.fraunhofer.de

English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Parts and components	✓
Services & consulting Engineering, Simulation	✓

Bio-based plastics: manufacturing load-bearing components in a material-efficient way

Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight material construction	✓
Functional integration	
Measuring and testing technology	
Modelling and simulation Loads & stress, Life-cycle analysis, Materials	✓
Plant construction & automation	
Recycling technologies Recycling	✓
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming	
Joining	
Material property alteration	
Primary forming Injection moulding	✓
Processing and separating	
Textile technology	

Bio-based plastics: manufacturing load-bearing components in a material-efficient way

Lightweighting classification

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