Resource-efficient and low-carbon: developing high-performance hemp composites

About this project

HempTape

Resource-efficient and low-carbon: developing high-performance hemp composites

Resource-efficient and low-carbon: developing high-performance hemp composites

About this project

Markets: 

Material: Bioplastics, Biocomposites, Natural fibres, Thermoplastics, Laid webs, Natural fibre reinforced plastics (NFRP)

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

Companies across all industries are faced with the challenge of finding high-performance and environmentally friendly materials. Glass fibre reinforced plastics (GRP), which are currently used in many technical applications, consume many resources and cause high CO# emissions. Bio-based materials, in particular natural fibre composites (NFRP), are becoming increasingly important here. They not only reduce the environmental impact, but also offer great potential in lightweight construction. Natural fibres such as hemp are characterised by their high availability and excellent mechanical properties and represent a promising alternative. However, many attempts to utilise these materials on an industrial scale have so far failed due to high production costs and inefficient processes. This is precisely where the HempTape project comes in.

Resource-efficient and low-carbon: developing high-performance hemp composites

About this project

Purpose

The project partners are developing a resource-efficient and low-carbon alternative to glass fibre-reinforced thermoplastics for high-performance applications - such as components subject to high mechanical stress in automotive and mechanical engineering. They focus on the production of innovative, staple fibre-reinforced semi-finished products with unidirectional fibre orientation (UD tapes) made from hemp fibres and biopolymers. UD tapes consist of short, loose fibres that are integrated into a matrix. These fibres orientate themselves in a preferred direction during production, which gives the components high strength and rigidity.

The challenge is to exploit the lightweight construction potential of natural fibres such as hemp while ensuring efficient, cost-effective production processes. The researchers are therefore developing bio-based materials that are comparable to current technologies for the production of GRP components, but with lower CO# emissions and reduced resource consumption. Another goal is to establish a cost-efficient and environmentally friendly value chain that enables the widespread use of these materials in various industries.

Procedure

The researchers are further developing existing production technologies for unidirectional semi-finished natural fibre products. Initially, they are concentrating on the production of high-quality hemp fibres from regional raw materials. They combine these fibres with biopolymers and process them into robust, high-performance semi-finished products using optimised processes. The scientists attach great importance to designing the processes in such a way that they can process the raw materials cost-effectively and efficiently.

They then test the mechanical properties of the materials and the resulting components using simulation-based design methods and material tests to ensure that they meet the requirements of high-performance applications.

The researchers also consider the recyclability of the developed materials in order to promote a closed cycle in production. In parallel with the technological development, they carry out ecological assessments to precisely quantify the CO# savings potential and resource efficiency of the new materials.

Resource-efficient and low-carbon: developing high-performance hemp composites

About this project

Funding duration:

Funding sign: 03LB3049 **Funding amount:** EUR 1.2 million

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3049A - HempTape in the federal funding catalogue

Resource-efficient and low-carbon: developing high-performance hemp composites

Project coordination

Contact:

Mr Lovis Kneisel

+49 0341 350375-82

info@fuse-composite.com

Organisation:

English (EN){{ Projektpartner }}

Hanffaser Uckermark eG, Indorama Ventures Fibers Gemany GmbH

Lightweighting classification

	Realisation
Offer	
Products Semi-finished parts, Systems and end products, Materials	✓
Services & consulting	

Resource-efficient and low-carbon: developing high-performance hemp composites

Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight manufacturing, Lightweight design, Lightweight material construction	✓
Functional integration	
Measuring and testing technology	
Modelling and simulation Crash behaviour, Loads & stress, Life-cycle analysis	✓
Plant construction & automation	
Recycling technologies Downcycling	✓
Manufacturing process	
Additive manufacturing Laminated object manufacturing (LOM)	✓
Coating (surface engineering)	
Fibre composite technology Pre-preg processing	✓
Forming Compression moulding, Thermal converting	✓
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology Preforming	✓

Resource-efficient and low-carbon: developing high-performance hemp composites

Lightweighting classification

	Realisation
Material	
Biogenic materials Bioplastics, Biocomposites	✓
Cellular materials (foam materials)	
Composites Natural fibre reinforced plastics (NFRP)	✓
Fibres Natural fibres	✓
Functional materials	
Metals	
Plastics Thermoplastics	✓
Structural ceramics	
(Technical) textiles Laid webs	✓