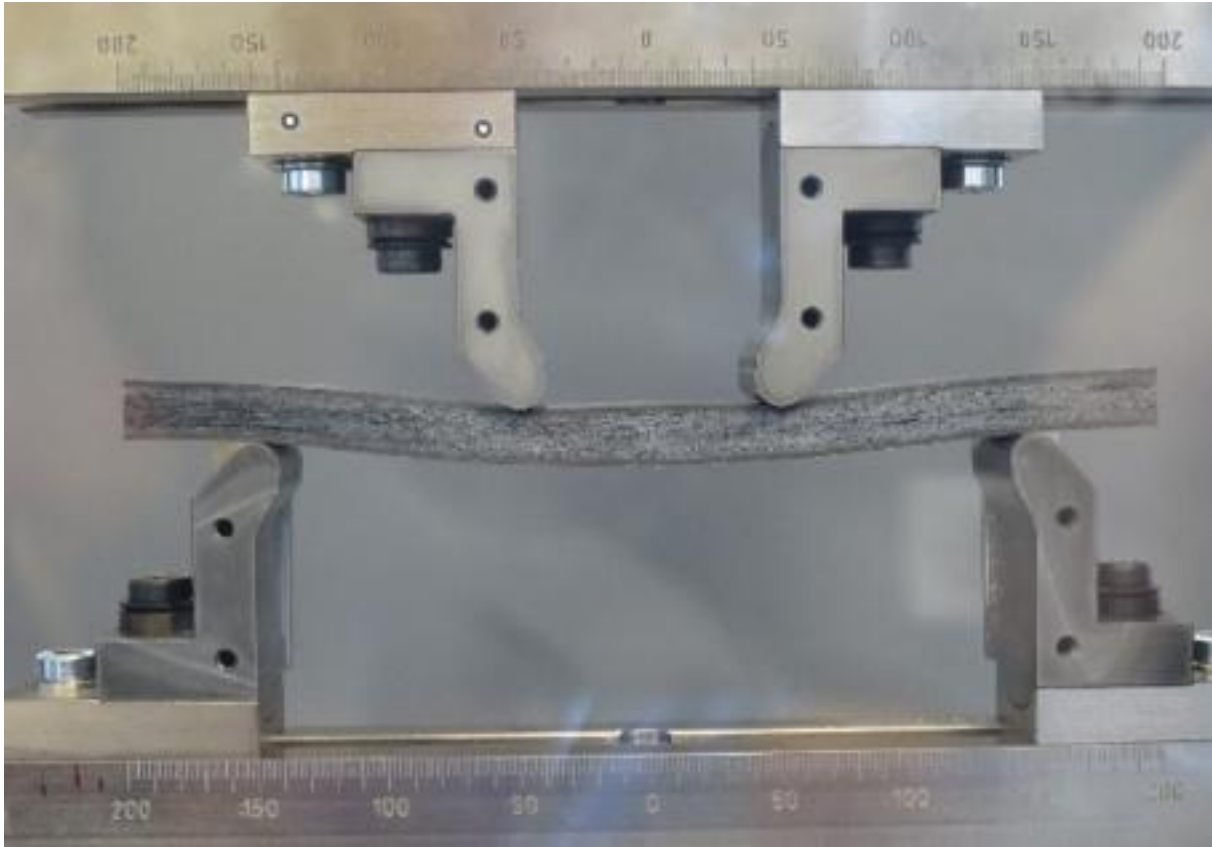


Sandwich components made from non-woven fabrics: using recycled carbon fibres

About this project



CO2-SaVer

Sandwich components made from non-woven fabrics: using recycled carbon fibres

Markets:



Material:

Carbon fibres, Thermoset plastics, Nonwovens, mats, 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

Carbon fibres are an important material for components that need to be lightweight yet particularly strong and rigid. However, industrial processing has not yet managed to utilise them in a resource-efficient manner. This is because the production of new carbon fibres consumes a great deal of energy. At the same time, the manufacture of carbon fibre-reinforced plastics (CFRP) generates a significant amount of off-cuts, which have so far rarely been reused in high-quality new components.

Recycled carbon fibres can help to reduce the demand for virgin material and make better use of existing fibre resources. However, to ensure they are suitable for demanding applications, researchers must process them into uniform, resilient and easily workable semi-finished products. Non-woven fabrics are particularly well-suited to this purpose. They can be easily shaped and tailored to meet specific component requirements; however, their use has so far been largely limited to semi-structural applications.

Purpose

As part of the CO₂-SaVer research project, researchers are developing components made from 100 per cent recycled carbon fibres. To this end, they are using non-woven fabrics that can also be incorporated into components subject to mechanical stress. The team aims to specifically improve the material quality, incorporate localised reinforcements and produce lightweight sandwich structures with high stiffness. To achieve this, the recycled fibres must be reliable to process and meet the requirements of the respective application.

In addition, the project partners are developing bio-based resin systems and equipping them with suitable additives for fire protection. In this way, they are laying the foundations for high-quality components made from recycled carbon fibres and opening up new possibilities for the efficient use of existing fibre resources.

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Procedure

The researchers first process recycled carbon fibres into non-woven fabrics and improve their uniformity. This enables them to reduce variations in basis weight and fibre distribution, which impair the properties of the components and make further processing more difficult. The project partners compensate for thin spots using 3D lofting technology. This involves applying additional fibres to areas where the resulting component will have to bear high loads.

The project team then processes the non-woven fabrics using the low-pressure RTM process, a resin injection method involving low pressure. At the same time, they are further developing the lofting process. To do this, the researchers open the mould during the process, allowing previously bent fibres to straighten and form a lightweight core structure with voids. This creates a sandwich-like structure with high flexural and compressive stiffness in a single step.

In addition, the project partners are investigating how the cover layers – that is, the outer layers of the component – can be securely bonded to the lofted core. They are also testing bio-based resin systems with fire-retardant additives and assessing the components for mechanical strength, long-term behaviour, vibration behaviour and electromagnetic shielding.

A demonstrator in the form of a side panel for a battery-electric lorry translates the results into a practical application.

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CO₂SaVer

Funding duration:

Funding sign:

03LB4013

Funding amount:

EUR 1.3 million

Final report

Further websites

foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB4013A - CO₂-SaVer in the federal government's funding catalogue
[www.igcv.fraunhofer.de/de/forschung/referenzprojekte/CO₂-SaVer-Sandwich-Strukturen-aus-Recyclingcarbonfaser.html](https://www.igcv.fraunhofer.de/de/forschung/referenzprojekte/CO2-SaVer-Sandwich-Strukturen-aus-Recyclingcarbonfaser.html) - Fraunhofer IGCV project website

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Project coordination

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Organisation:

English (EN){ { Projektpartner } }



Oskar Dilo Maschinenfabrik KG

Lightweighting classification

Realisation

Offer

Products

Parts and components, Semi-finished parts,
Materials



Services & consulting

Consulting, Testing and trials, Engineering,
Prototyping, Validation, Simulation, Technology
transfer



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Lightweighting classification	
	Realisation
Field of technology	
Design & layout Lightweight design, Hybrid structures, Lightweight material construction	✓
Functional integration Material functionalisation	✓
Measuring and testing technology Component and part analysis, Visual analysis (e.g. microscopy, metallography), Materials analysis, Destructive analysis, Non-destructive analysis	✓
Modelling and simulation Loads & stress, Life-cycle analysis, Structural mechanics, Materials	✓
Plant construction & automation Plant construction	✓
Recycling technologies Recycling	✓
Manufacturing process	
<i>Additive manufacturing</i>	
<i>Coating (surface engineering)</i>	
Fibre composite technology Resin infusion process, Resin transfer moulding	✓
<i>Forming</i>	
<i>Joining</i>	
<i>Material property alteration</i>	
<i>Primary forming</i>	
<i>Processing and separating</i>	
Textile technology Nonwoven & mats production	✓

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Lightweighting classification	
	Realisation
Material	
<i>Biogenic materials</i>	
<i>Cellular materials (foam materials)</i>	
Composites Carbon-fiber reinforced plastics (CFRP)	✓
Fibres Carbon fibres	✓
<i>Functional materials</i>	
<i>Metals</i>	
Plastics Thermoset plastics	✓
<i>Structural ceramics</i>	
(Technical) textiles Nonwovens, mats	✓