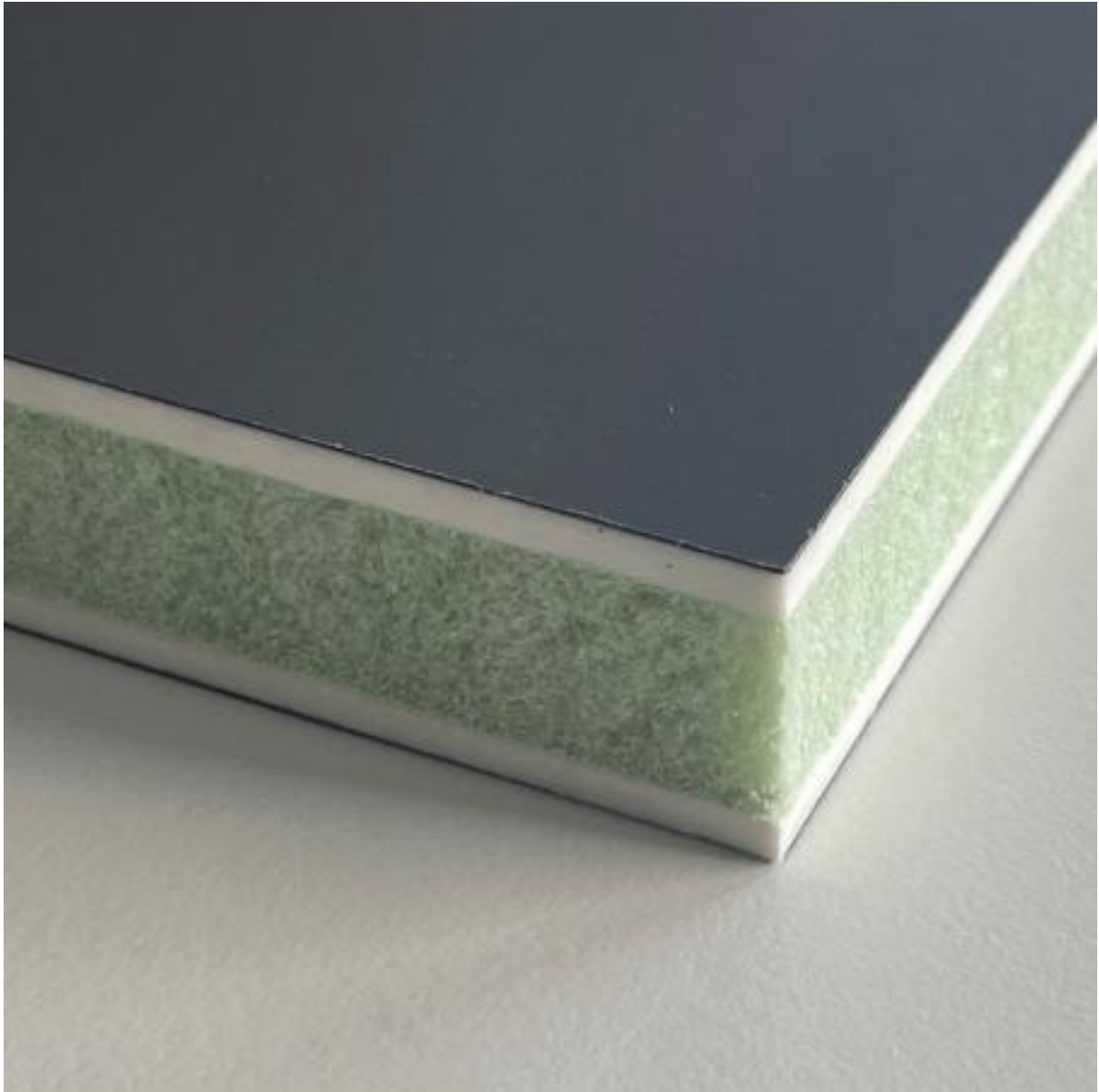


Recyclable sandwich panels: specifically replacing composite materials

About this project



TherMono

Recyclable sandwich panels: specifically replacing composite materials

Markets:



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About this project

Material: Thermoplastics

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

In furniture manufacturing, interior fit-outs and bodywork for transport vehicles, manufacturers use large-area, lightweight yet durable sandwich and composite materials. Whilst these construction methods are technically suitable for many applications, recycling these materials at the end of a product's life is often a complex process.

Manufacturers generally design components as composite materials, using several different material classes, such as plastic face layers, foam cores, wood-based materials, binders or coatings. This makes it difficult to separate the materials after use and recycle them to a high standard. In many cases, therefore, thermal recovery is the result.

Particularly in high-volume applications, there is a growing need for material concepts that better combine technical performance with recyclability. Furthermore, in interior fit-out, formaldehyde-containing binders in wood-based materials make recycling even more difficult. Consequently, recyclable sandwich materials are required that can be manufactured, processed and recycled on an industrial scale.

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Purpose

As part of the TherMono research project, the project team is developing monomaterial sandwich panels for interior fit-outs, furniture manufacturing and the transport sector. 'Monomaterial' means that all the plastic components of a sandwich panel belong to the same material class. The researchers are applying this principle to applications where composite materials – which are usually difficult to recycle – have traditionally been used. In doing so, they are laying the foundations for recycling the panels at the end of their useful life and keeping the plastics used within the circular economy.

At the same time, the partners are tailoring the new materials to the requirements of industrial applications. The panels must be durable, formable and cost-effective to process. For interior fittings, the team is also aiming for material solutions that do not contain formaldehyde-based binders. This results in recyclable sandwich materials that reduce the demand for primary raw materials and avoid the greenhouse gas emissions currently generated during the thermal recycling of conventional composites.

Procedure

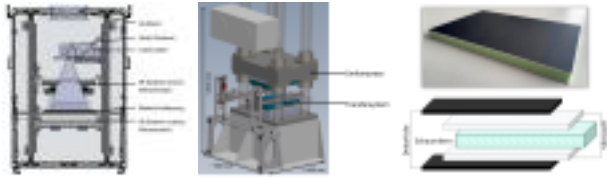
First, the researchers select suitable thermoplastic materials for the outer layers, core and functionalisation. They then develop manufacturing processes for these individual components and a joining method that allows the layers to be bonded into sandwich panels using heat and without the need for additional adhesives.

At the same time, the project team is developing a stable forming process to ensure that the panels can be reliably processed further for specific applications. This involves a bespoke heating process that creates a temperature gradient across the entire thickness of the sandwich material, which is necessary for forming the material without damaging the sandwich layers. A seamless digital process chain supports production, ensures quality and provides data to optimise upstream process steps in a targeted manner. In addition, the partners are developing a recycling process for the new sandwich composites.

Finally, the researchers are manufacturing and testing demonstrator components for furniture applications. For these products, they are calculating the 'product carbon footprint' – that is, the greenhouse gas balance of a product over its life cycle – to demonstrate the contribution of the developed technologies to climate protection.

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Funding duration:

Funding sign:

03LB2081A

Funding amount:

EUR 759 thousand

Final report

Further websites

foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2081A - TherMono featured in the federal government's funding catalogue
www.ipt.fraunhofer.de/de/projekte/thermono.html - Fraunhofer IPT project website

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Project coordination

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English (EN){ { Projektpartner } }



Lightweighting classification

Realisation

Offer

Products

Parts and components, Semi-finished parts



Services & consulting

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Lightweighting classification	
	Realisation
Field of technology	
Design & layout Lightweight design, Lightweight material construction	✓
Functional integration Sensor technology, Others (Heating module)	✓
Measuring and testing technology Component and part analysis, Others (Life Cycle Assessment (LCA))	✓
Modelling and simulation Multiphysics simulation, Materials	✓
Plant construction & automation Plant construction, Handling technology, Others (Digitalisation)	✓
Recycling technologies Recycling	✓
Manufacturing process	
<i>Additive manufacturing</i>	
<i>Coating (surface engineering)</i>	
<i>Fibre composite technology</i>	
Forming Thermal converting	✓
Joining Others (Thermal joining)	✓
<i>Material property alteration</i>	
<i>Primary forming</i>	
<i>Processing and separating</i>	
<i>Textile technology</i>	

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Lightweighting classification	
	Realisation
Material	
<i>Biogenic materials</i>	
<i>Cellular materials (foam materials)</i>	
<i>Composites</i>	
<i>Fibres</i>	
<i>Functional materials</i>	
<i>Metals</i>	
Plastics	✓
Thermoplastics	
<i>Structural ceramics</i>	
<i>(Technical) textiles</i>	