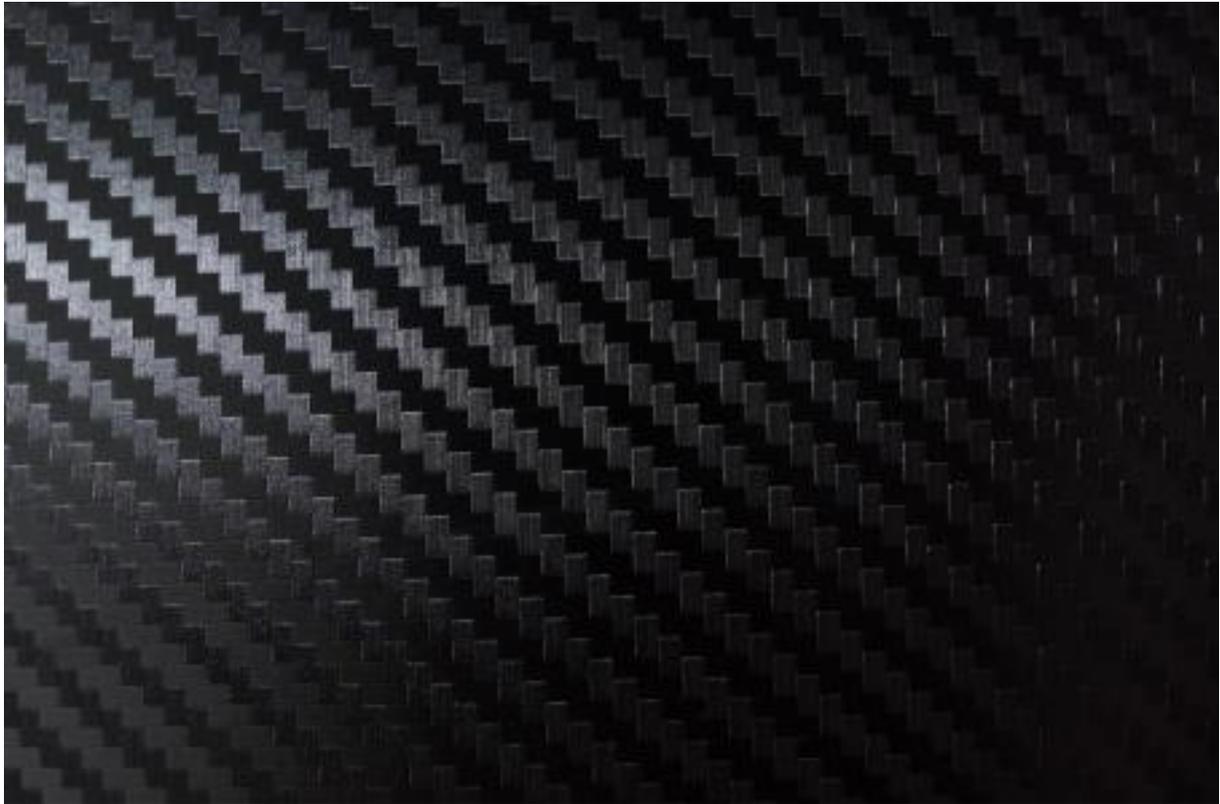


AI-based oven concept: precise heating of tailored organo-sheets in hybrid moulding

About this project



OstOS

AI-based oven concept: precise heating of tailored organo-sheets in hybrid moulding

Markets:



Material:

Other biogenic materials, Carbon fibres, Other functional materials, Thermoplastics, Other metals, Other structural ceramics, Other (technical) textiles, Carbon-fiber reinforced plastics (CFRP), Other cellular materials (foam materials)

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About this project

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

The hybrid moulding process combines thermoforming and injection moulding into an automated process for ready-to-install lightweight structural components. Continuous fibre-reinforced thermoplastics, so-called organo-sheets, are used as semi-finished products. Tailored organo-sheets are particularly efficient. They are designed to suit the load path, are locally reinforced and only use material where it is mechanically required. This significantly reduces weight, resource consumption and CO₂ emissions.

Before thermoforming, these semi-finished products must be heated in a targeted and uniform manner. In hybrid moulding, this task is performed by an infrared oven system. Current oven systems reach their limits here. Large-area infrared emitters do not heat tailored organo-sheets with locally varying wall thicknesses homogeneously. This results in over- or under-temperatures that impair component quality. In addition, product changes require a great deal of manual effort, as the heating quality is not recorded over the entire surface and process knowledge must be adapted individually. These limitations reduce flexibility, efficiency and process reliability and have so far prevented the widespread industrial use of load-path-optimised organo-sheets. This is where the OsTOS project comes in.

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Purpose

The project team is developing a new type of oven system for processing tailored organo-sheets in hybrid moulding. The aim is to achieve uniform and reproducible heating of complex semi-finished products that can only be processed safely within a very small temperature range. The system should enable fully automatic product changes and evaluate the heating quality of the entire organo-sheet immediately before moulding.

With the new system concept, the researchers are improving the coordination between the oven and the injection moulding process and expanding the range of materials that can be processed. Recycled carbon fibres and natural fibres should also be able to be processed reliably. The project thus contributes to resource-efficient lightweight construction, the reduction of CO₂ emissions in production and use and the industrialisation of tailored organo-sheets for series applications through to safety-critical areas.

Procedure

The researchers are pursuing a combined approach of hardware and control innovation. An infrared camera records the surface temperature of the organo-sheet over the entire surface and close to the process directly at the thermoforming site. In this way, the system also takes into account temperature changes that occur during handling or transport.

The team replaces large-area heaters with a large number of small-area, individually controllable infrared heaters. This significantly increases the spatial resolution of the heating output. The system applies the energy specifically where the semi-finished product needs it.

An AI-supported control system links thermography data and the emitter field. The system learns from each heating cycle, optimises the heating rates independently and adapts to new products without manual intervention. On this basis, the project team demonstrates the oven system in a pilot application and raises the technological maturity level to the industrial application stage.

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About this project			
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Funding duration:			
<hr/>			
<hr/>			
Funding sign:	03LB3027	Funding amount:	EUR 2.3 million
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Final report			
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Further websites	foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3027A - OsTOS 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 Semi-finished parts, Systems and end products, Materials	✓
Services & consulting Engineering, Prototyping, Simulation	✓
Field of technology	
Design & layout Lightweight manufacturing, Hybrid structures	✓
Functional integration Thermal activation	✓
Measuring and testing technology Component and part analysis, Materials analysis	✓
Modelling and simulation Loads & stress, Life-cycle analysis, Structural mechanics	✓
Plant construction & automation Plant construction	✓
Recycling technologies Recycling	✓

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Lightweighting classification	
	Realisation
Manufacturing process	
Additive manufacturing Others	✓
Coating (surface engineering) Others	✓
Fibre composite technology Others	✓
Forming Compression moulding	✓
Joining Others	✓
Material property alteration Heat treatment	✓
Primary forming Injection moulding	✓
<i>Processing and separating</i>	
Textile technology Others	✓

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Lightweighting classification	
	Realisation
Material	
Biogenic materials Others	✓
Cellular materials (foam materials) Others	✓
Composites Carbon-fiber reinforced plastics (CFRP)	✓
Fibres Carbon fibres	✓
Functional materials Others	✓
Metals Others	✓
Plastics Thermoplastics	✓
Structural ceramics Others	✓
(Technical) textiles Others	✓