Integrate thermal and sound insulation: Hybrid structures with melamine resin foam

About this project

AtiLMeS

Integrate thermal and sound insulation: Hybrid structures with melamine resin foam

Markets:

Material: Glass fibres, Thermoplastics, Glass-fiber reinforced plastics (GFRP), Open-pore

Integrate thermal and sound insulation: Hybrid structures with melamine resin foam

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

In the mobility and mechanical engineering sectors in particular, it is important to design components that are not only lightweight but also functionally integrated. There is a growing demand for materials that not only offer rigidity and low weight, but also additional characteristic properties such as sound or heat insulation. Conventional lightweight construction materials often reach their limits here: Either they are mechanically efficient but hardly effective acoustically or thermally, or they offer good insulating properties but have low strength and rigidity.

Hybrid material concepts that specifically combine different materials open up new technical possibilities. This is where the AtiLMeS project comes in. The participants are researching efficient production processes for material composites in order to enable the production of lightweight components with comprehensive acoustic and thermal functions.

Purpose

The aim of the project team is to develop innovative composite components based on fibre-plastic composites and melamine resin foams. The aim is to create a high-performance composite that is not only characterised by low weight and high strength, but also has acoustic and thermal insulation properties. Compared to conventional solutions using metal-foam structures, there are also considerable advantages due to the elimination of several complex process stages, which can reduce process costs and times.

The focus is on production in a single-stage thermoforming process, for which the participants are developing innovative production tools. The result is a new combination of materials that is suitable for use in vehicles, machines and buildings, for example as insulating structural components between the engine compartment and vehicle interior or in battery-powered drive systems.

Integrate thermal and sound insulation: Hybrid structures with melamine resin foam

About this project

Procedure

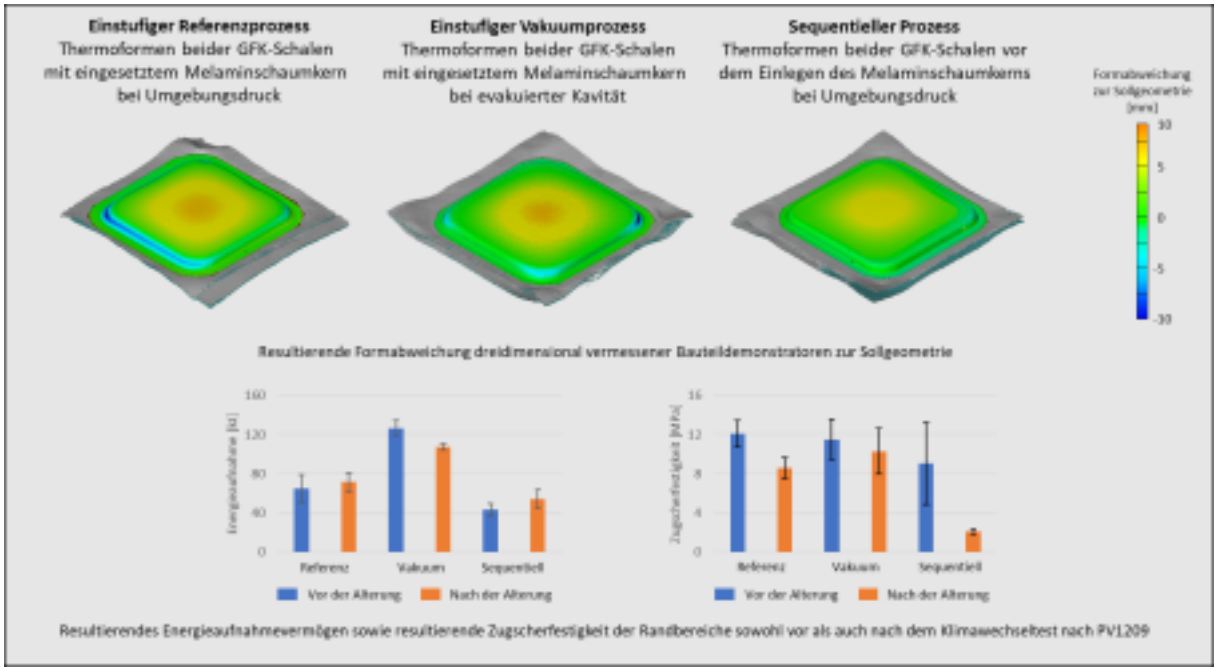
The team is initially investigating the mechanical, thermal and acoustic properties of the glass fibre-reinforced PA6 semi-finished product, the melamine resin foam and the resulting composite material. The participants then develop various process routes and analyse which hybrid sandwich structures can be produced. The foam serves as the core material, which is surrounded by load-bearing cover layers made of glass fibre-reinforced PA6.

Based on a simulation-supported design of the process routes to achieve suitable composite properties, the researchers validate the simulation data on a demonstration geometry. They analyse dimensional accuracy, structural integrity, composite strength and the thermal and acoustic insulation effect. In doing so, they specifically optimise the connections between the material layers, the geometry and dimensions of the layers as well as their structure, for example through integrated stiffening ribs. In this way, they ensure mechanical stability as well as acoustic and thermal performance.

In addition, the researchers carry out investigations into the ageing and recyclability of the composite. Finally, they compare and evaluate the various process routes with regard to the resulting properties. On this basis, they create the foundation for using innovative multifunctional lightweight materials with validated process routes in real applications.

Integrate thermal and sound insulation: Hybrid structures with melamine resin foam

About this project



Funding duration:

Funding sign: 03LB3062 **Funding amount:** EUR 925 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3062A - AtiLMeS in the federal funding catalogue

Integrate thermal and sound insulation: Hybrid structures with melamine resin foam

Project coordination

Contact:

Mr Dipl.-Ing. Ralf Kraft

+49 02377 7865-55

rkraft@kleine-gmbh.com

Organisation:

Jürgen Kleine GmbH

Westerhaar 15b
58739 Wickede
North Rhine-Westphalia
Germany

www.kleine-engineering.com/

English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Semi-finished parts, Tools and moulds	✓
Services & consulting Consulting, Testing and trials, Engineering, Validation, Simulation, Technology transfer	✓

Integrate thermal and sound insulation: Hybrid structures with melamine resin foam

Lightweighting classification

	Realisation
Field of technology	
Design & layout Hybrid structures, Lightweight material construction	✓
Functional integration	
Measuring and testing technology	
Modelling and simulation Loads & stress, Multiphysics simulation, Materials	✓
Plant construction & automation	
Recycling technologies	
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology Pre-preg processing	✓
Forming Thermal converting	✓
Joining Others (material bonding through thermal consolidation)	✓
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

Integrate thermal and sound insulation: Hybrid structures with melamine resin foam

Lightweighting classification

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