Optimising battery housings for e-cars: with aluminium foam and more efficient production

About this project

COOLBat

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Markets:

Material: Aluminium, Open-pore

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Climate Action.

Technology Transfer Program Leichtbau

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Context

Electric cars can help to reduce greenhouse gas emissions in the transport sector and protect the climate. The battery system is the centrepiece of modern electric cars and a central component for sustainable mobility. With innovative design principles, materials and production processes, lightweight construction can help to make battery systems lighter, optimise their properties in use and make their production more efficient.

Purpose

The aim of the COOLBat research project is to increase the range of electric cars by reducing the weight of the battery housing. At the same time, the researchers want to improve the performance of the batteries and enable faster charging times. In addition, the project team is investigating how the production of battery housings can be made significantly more efficient using lightweight construction approaches in order to reduce CO2 emissions during production.

The battery system of an electric car being analysed serves as a reference and demonstrator for the researchers. The research results will then serve as a blueprint for the development, optimisation and scaling of specific lightweight materials and technologies for other industries and applications, such as trains, aircraft and ships or food and medical transport.

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Procedure

The researchers are scrutinising all development steps to see how they can contribute to CO2 savings and sequestration. To do this, they look at the entire battery system. In addition to the battery module with its cells, this includes the housing with structures for load distribution and temperature control. These include frames, covers and base plates, which protect the batteries from overheating and damage.

The team combines individual systems in order to integrate more functions in a smaller space and with fewer interfaces. The aim is to combine thermal and mechanical tasks. In future, support structures will contain directly moulded-in temperature control channels. In the floor panels, for example, the function of the cooling unit will be combined with that of crash protection in a single component.

The use of aluminium foam enables optimum load distribution and energy absorption in the event of an accident. The foam is combined with a so-called phase change material that can store heat and cold energy and release it again as required. This combination of materials also reduces the amount of energy required to cool the battery. The cover of the battery housing is designed in such a way that the housing can optimally absorb the loads acting on it. In addition, the participants are developing new heat-conducting materials to replace more expensive and environmentally harmful heat-conducting pastes. The lightweight construction solutions used should save 15 per cent CO2 per battery housing.

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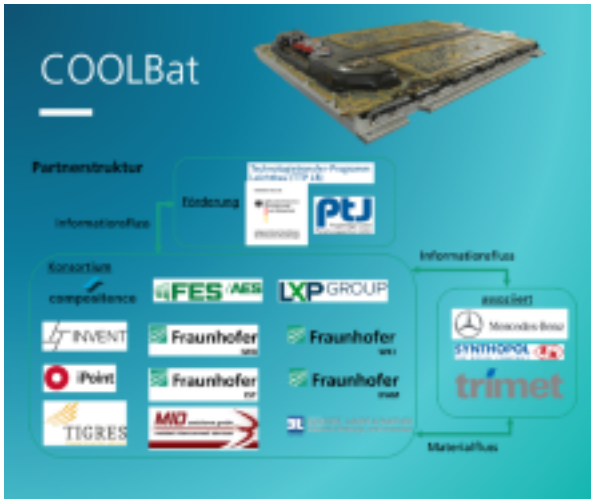

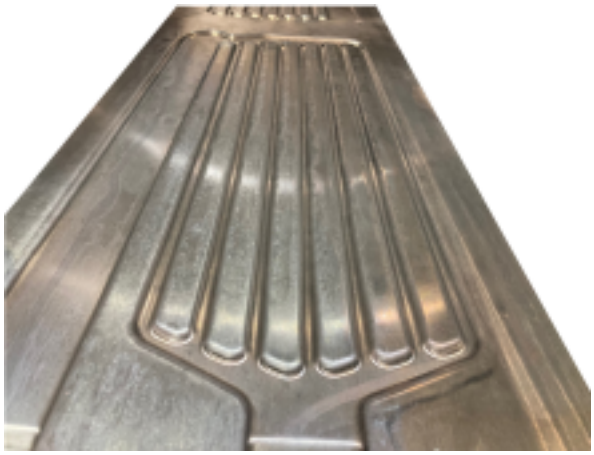

Funding duration:

Project partner:

FES, INVENT, compositence, iPoint, LXP GROUP, BL PARTNER, MID, Fraunhofer IFAM, Fraunhofer IST, Fraunhofer WKI

Funding sign:	03LB2005	**Funding amount:**	EUR 2.9 million

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2005B - CoolBat in the federal funding catalogue

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Project coordination

Contact:

Mr Dipl.-Ing. Rico Schmerler

+49 0172 5618108

Rico.Schmerler@iwu.fraunhofer.de

Organisation:

Fraunhofer Institute for Machine Tools and Forming Technology

Reichenhainer Str. 88
09126 Chemnitz
Saxony
Germany

www.iwu.fraunhofer.de

Lightweighting classification

	Realisation
Offer	
Products Parts and components, Machines and plants, Systems and end products, Materials, Tools and moulds	✓
Services & consulting Testing and trials, Engineering, Validation, Simulation, Technology transfer	✓

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Lightweighting classification

Field of technology	Realisation
Design & layout Lightweight manufacturing, Lightweight design, Hybrid structures	✓
Functional integration Sensor technology, Material functionalisation	✓
Measuring and testing technology Component and part analysis, Visual analysis (e.g. microscopy, metallography), System analysis, Materials analysis, Non-destructive analysis	✓
Modelling and simulation Crash behaviour, Loads & stress, Life-cycle analysis, Multiphysics simulation, Optimisation, Structural mechanics, Materials, Reliability validation	✓
Plant construction & automation Plant construction, Handling technology	✓
Recycling technologies Recycling	✓

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Lightweighting classification

	Realisation
Manufacturing process	
Additive manufacturing Others (aluminium foam)	✓
Coating (surface engineering)	
Fibre composite technology	
Forming Compression moulding	✓
Joining Adhesive bonding, Welding	✓
Material property alteration Thermomechanical treatment, Heat treatment	✓
Primary forming	
Processing and separating Drilling, Milling	✓
Textile technology	
Material	
Biogenic materials	
Cellular materials (foam materials) Open-pore	✓
Composites	
Fibres	
Functional materials	
Metals Aluminium	✓
Plastics	
Structural ceramics	
(Technical) textiles	