Aluminium die casting for complex components: Sustainable use of cast salt cores

About this project

Salzig

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Markets:

Material: Others (Salts), Aluminium

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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

Aluminium die casting is a key process in lightweight construction. Companies can use it to produce precise, lightweight and resilient components in large quantities - for vehicles or machines, for example. However, companies are usually unable to produce elements with complicated internal geometries, such as cavities or internal channels, using this process because they are located deep within the component or are difficult to access.

So-called cast salt cores offer a solution: they are inserted into the mould as placeholders before casting, rinsed out with water after casting and thus enable the production of hollow, lightweight components. This technology is technically mature and well known.

However, it has yet to make a breakthrough in industry. The reason: the salt mixtures used to date cannot be recycled. The decoring process produces brine, which requires energy-intensive treatment or expensive disposal. This contradicts ecological and economic requirements. There is also a lack of specialised suppliers for the salt cores - foundries would have to produce them themselves.

Purpose

This is where the Salzig research project comes in. The team wants to create a consistently sustainable, economical and scalable solution for lightweight construction with hollow-cast aluminium components. The focus is on creating a closed material cycle. The project partners want to develop a salt mixture that can not only be processed using die-casting technology, but can also be recycled.

For this purpose, the researchers are using salts that are also used in the chemical industry for fertilisers. The brine produced during decoring is to be recycled instead of being disposed of. In this way, the project team aims to make salt core technology more environmentally friendly and economically attractive.

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Procedure

The project team is initially developing a specially adapted salt mixture for use in low-pressure die casting. This mixture must be stable enough to withstand the extreme conditions in aluminium die casting - with metal speeds of up to 80 m/s and post-compression pressures of up to 1200 bar - and at the same time remain readily soluble in water.

At the same time, the researchers use digital simulation methods to design both the geometries of the components and the salt cores. In production, they manufacture the cores, cast them with aluminium and then core them with a high-pressure water jet. The partners analyse the resulting brine for its chemical properties. They test whether the brine is suitable for direct use in industrial processes, in particular for the production of mineral salts for fertilisers. The project partners are linking all work steps - from design to recycling the brine solution - to create a continuous process chain.

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Funding duration:

Funding sign: 03LB4001 **Funding amount:** EUR 835 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB4001A - Salzig 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 Parts and components, Machines and plants, Materials, Tools and moulds	✓
Services & consulting Testing and trials, Simulation, Technology transfer	✓
Field of technology	
Design & layout Lightweight manufacturing, Lightweight design	✓
Functional integration	
Measuring and testing technology Component and part analysis, Materials analysis	✓
Modelling and simulation Processes, Materials	✓
Plant construction & automation Plant construction	✓
Recycling technologies Recycling	✓
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming	
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials Others (Salts)	✓
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals Aluminium	✓
Plastics	
Structural ceramics	
(Technical) textiles	