Combining additive and conventional processes: production of hybrid lightweight components

About this project

AutoSplit

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Markets:

Material: Aluminium, Steel, Titanium

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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

Conventional manufacturing processes such as sheet metal processing and machining reach their limits in the production of complex lightweight components. These processes are particularly economical in large-scale production, but offer little flexibility for customised, functionally optimised components. In the automotive and aerospace industries in particular, there is a growing need for innovative solutions that reduce weight while utilising materials and energy more efficiently.

At the same time, additive manufacturing has established itself as a promising technology for producing geometrically complex components in a lightweight and resource-efficient manner. However, the use of this technology remains a challenge for industrial applications due to high costs and limited machine capacities.

The researchers in the AutoSplit project aim to close this gap by combining the advantages of additive manufacturing with those of traditional processes to create a flexible, cost-effective and sustainable manufacturing solution.

Purpose

The research team is developing an automated and intelligent process chain for the efficient production of lightweight components. Through hybrid production, i.e. the combination of additive and conventional manufacturing processes, the researchers want to reduce costs by more than 40 per cent compared to purely additive manufacturing and reduce the weight of the components by more than 25 per cent compared to traditional methods. At the same time, they want to reduce the effort required to identify suitable components by 90 per cent and cut CO# emissions in production by at least 30 per cent. The researchers hope to use the technology to achieve significant CO# savings and open up new lightweight construction applications, particularly in the aviation and automotive industries as well as in mechanical engineering.

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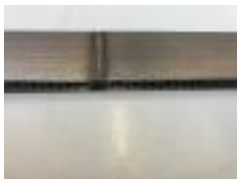
Procedure

The team is developing a systematic methodology for efficiently linking component design and production. Firstly, the researchers identify suitable components and divide them into areas for additive and conventional manufacturing. To do this, they use a specially developed software solution that utilises a machine learning algorithm to segment the components and thus enable them to be applied to a large number of components.

At the same time, the team is optimising conventional manufacturing processes for lightweight construction requirements, taking into account both functional and economic aspects. The researchers are also further developing the interfaces between the different manufacturing processes to ensure seamless integration.

Finally, the project team is testing the developed methods by manufacturing demonstrators from the aviation and automotive industries. These real-life applications illustrate the advantages of hybrid manufacturing and create the basis for broader industrial implementation.


Funding duration:

Funding sign:	03LB3081	**Funding amount:**	EUR 795 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3081A - AutoSplit in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Parts and components	✓
Services & consulting Consulting, Testing and trials, Engineering, Prototyping, Simulation, Technology transfer	✓

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight manufacturing, Hybrid structures	✓
Functional integration	
Measuring and testing technology Component and part analysis, Destructive analysis	✓
Modelling and simulation Loads & stress, Life-cycle analysis, Optimisation, Others (Development of a machine learning (ML) algorithm for automation)	✓
Plant construction & automation Plant construction	✓
Recycling technologies	
Manufacturing process	
Additive manufacturing 3D printing, Selective laser melting (SLM, LPBF, ...)	✓
Coating (surface engineering)	
Fibre composite technology	
Forming Bending	✓
Joining Adhesive bonding, Riveting, Screwing, Welding	✓
Material property alteration	
Primary forming	
Processing and separating Drilling, Turning, Milling, Grinding, Others (Machining (general))	✓
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals Aluminium, Steel, Titanium	✓
Plastics	
Structural ceramics	
(Technical) textiles	