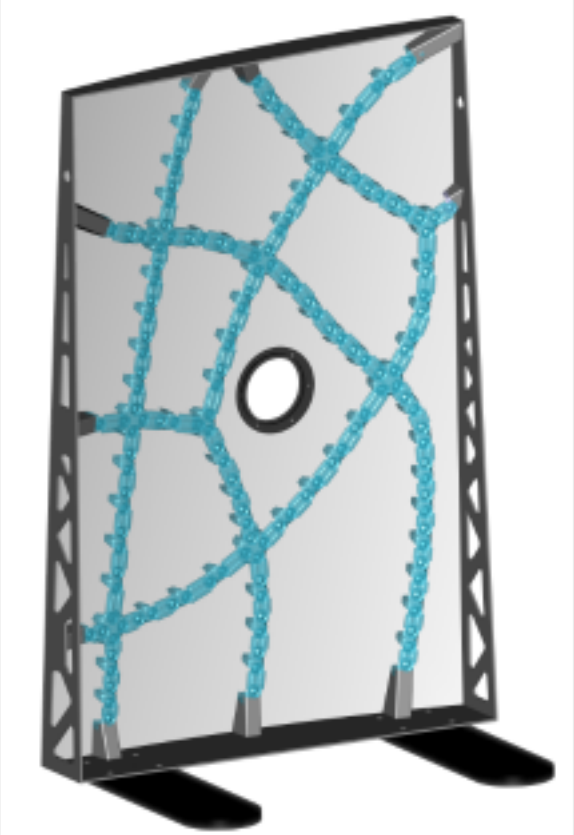
Efficient lightweight vehicle construction: modular production of large components

About this project



MobiXL

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Markets:

Material: Steel

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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

Lightweight construction and sustainability are key issues in vehicle construction in order to increase material and energy efficiency and reduce CO# emissions. Non-linear structures - inspired by natural models - offer promising opportunities to develop lighter and more stable components. However, manufacturing processes such as 3D printing have their limits here: Insufficient production speeds, a lack of approvals and process-related post-processing costs have so far prevented large-scale use. This is where the MobiXL project comes in.

Purpose

The aim of the researchers is to develop a new process with which bionically optimised large components for vehicle production can be produced efficiently, cost-effectively and sustainably. The team aims to achieve a weight reduction of 15 to 20 per cent in stiffening structures compared to current designs. These savings not only reduce material consumption, but also CO# emissions over the entire life cycle of a vehicle. The scientists are focusing on transferring the advantages of topology-optimised designs to large-scale production. To do this, they break down the complex structures into modular elements that are automatically manufactured and laser-welded. The complete digitalisation of the processes should also reduce production time by up to 80 percent and enable broader industrial application, for example in aviation or shipbuilding. The project team is demonstrating the practicality of the technology by producing two industry-specific demonstrators for rail vehicle and shipbuilding.

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Procedure

The project team is developing a new design principle that modularises topology-optimised structures. Instead of large linear individual parts, the researchers are using smaller, easy-to-manufacture modules that can be joined to form non-linear structures. The researchers integrate state-of-the-art laser welding technologies and intelligent control systems to efficiently organise the joining process of the modules. Finally, the researchers demonstrate the suitability of the process for series production using a tensile side wall segment and a shipbuilding panel. The successful patent application also confirms the novelty of the process. Despite the progress made, there is still a need for further research, particularly in terms of optimising the interactions identified between the modules and the overall component under load.

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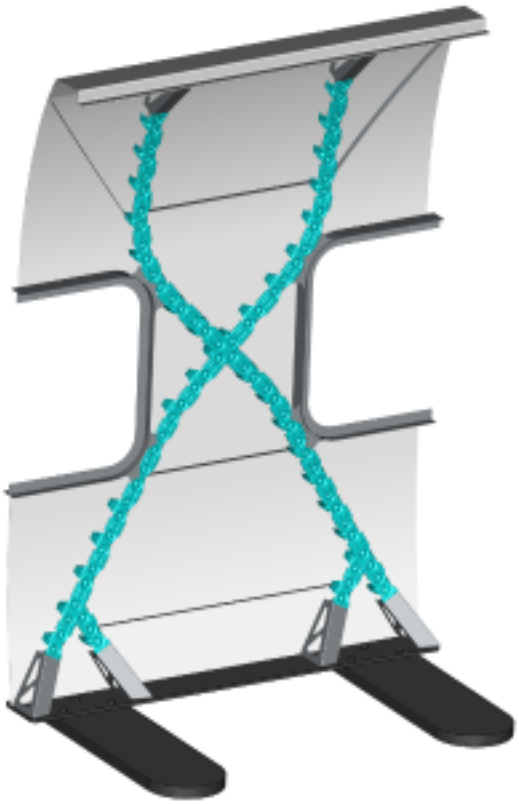

Funding duration:

Funding sign:	03LB1003	**Funding amount:**	EUR 175 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB1003 - MobiXL 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	

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight manufacturing	✓
Functional integration	
Measuring and testing technology	
Modelling and simulation	
Plant construction & automation	
Recycling technologies	
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming Deep-drawing	✓
Joining Welding	✓
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

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Lightweighting classification

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