

Saving resources in concrete construction: new concepts for large-format carbon fibre reinforcement

About this project



CC-Mesh

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Markets:



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Material: Carbon fibres, Laid webs, Textile-reinforced concrete

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](#)

Context

Concrete is currently the most widely used building material in the world. However, its production causes high greenhouse gas (GHG) emissions. To increase the load-bearing capacity of concrete components, so-called reinforcement is inserted into the concrete. This usually consists of steel mats, rods or mesh, which require a thick concrete cover due to their susceptibility to corrosion and therefore cause high GHG emissions.

Carbon fibres, on the other hand, are six times more effective than steel and are not susceptible to corrosion. The use of carbon fibres instead of steel can therefore significantly reduce the amount of reinforcement and concrete required. However, different load cases have so far been considered separately when designing steel and carbon fibre reinforcement. This can lead to over-reinforcement and thus to an increased use of resources.

Purpose

The project partners want to develop innovative, large-format carbon reinforcements for concrete construction and optimise them for industrial application. These carbon structures should be force-flow-compatible and particularly durable, resulting in resource-saving concrete components. To achieve this, they want to combine design and construction principles from lightweight construction with those of conventional concrete construction. This would also reduce GHG emissions during production and release them into the environment. The project partners anticipate a GHG savings potential of 86 per cent in the area of building construction compared to conventional reinforced concrete construction.

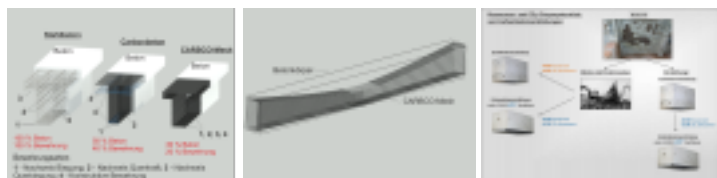
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Procedure

The team no longer installs individual reinforcements for the different load cases, but an optimised and self-contained reinforcement structure. As a result, three-dimensional structures can be created that optimally adapt to the flow of forces and are therefore highly effective and resource-saving. The reinforcements could then be cast with a lower concrete cover. This allows significant material savings to be made on both the concrete and the reinforcement.

Thanks to its cross-technology composition, the team can cover the entire value chain. The geometry and mechanical properties of the innovative reinforcement structure have been optimised and the production process adapted accordingly over the course of the project to date. A process for the production of impregnated and wrapped fibre strands was developed, which enables a very high utilisation of the fibre tensile strength in the strands through an optimised alignment of the individual fibres. The mechanical properties of the reinforcement within concrete components can also be optimally utilised by optimising the strand arrangement within the reinforcement cages on a test basis.



Funding duration:

Project partner:



Funding sign:

03LB3003

Funding amount:

EUR 1.8 million

Further websites

foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB3003A - CC-Mesh in the federal funding catalogue

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Project coordination

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Lightweighting classification

Realisation

Offer

Products

[Parts and components](#)



Services & consulting

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Lightweighting classification	
	Realisation
Field of technology	
Design & layout Lightweight construction concepts	✓
<i>Functional integration</i>	
<i>Measuring and testing technology</i>	
<i>Modelling and simulation</i>	
<i>Plant construction & automation</i>	
<i>Recycling technologies</i>	
Manufacturing process	
<i>Additive manufacturing</i>	
<i>Coating (surface engineering)</i>	
Fibre composite technology Filament winding	✓
<i>Forming</i>	
<i>Joining</i>	
<i>Material property alteration</i>	
<i>Primary forming</i>	
<i>Processing and separating</i>	
<i>Textile technology</i>	

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Lightweighting classification	
	Realisation
Material	
<i>Biogenic materials</i>	
<i>Cellular materials (foam materials)</i>	
Composites Textile-reinforced concrete	✓
Fibres Carbon fibres	✓
<i>Functional materials</i>	
<i>Metals</i>	
<i>Plastics</i>	
<i>Structural ceramics</i>	
(Technical) textiles Laid webs	✓