RWTH Technology
3D-concrete printing with integrated textile reinforcement

Navigable formwork

Textile reinforcement

3D printed concrete

RWTH Innovation GmbH
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#2442

Fields of application
printed buildings,

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Challenge

Digital concrete component production is a promising technology for the construction sector that offers numerous advantages, such as a high degree of design freedom, easy customisability and the potential for resource-efficient and sustainable construction. However, the integration of reinforcing materials into digitally produced concrete structures, which are necessary to transfer tensile and flexural loads within the concrete structure, proves to be a challenge. One possible solution is the use of textile grid structures as reinforcement.

Textiles are very malleable and allow a high degree of design freedom. Due to these properties, textile reinforcements are very well suited for use in digital concrete production. Initial trials with fibre-based and textile reinforcements have already been carried out and published. However, current studies only use short fibres mixed into the concrete matrix or textile reinforcements in printing direction of the concrete, which do not allow reliable load transfer of tensile stresses within the structure. For this purpose, reinforcing textiles are fixed vertically and the 3D concrete printing process is applied horizontally, "through" the textile.

Solution

By printing in layers in the direction of the reinforcement and observing the correct print head angle, as well as the correct printing pressure, concrete adhesion between the printed layers can be ensured. On the opposing reinforcement side of the print head, the compact formwork moves automatically in synchronization with the print head movement, which presses the concrete already printed through the reinforcement back against the reinforcement, thus enabling the reinforcement to be completely enclosed and preventing the so-called cast shadow formation. In addition, the navigable formwork creates a smooth concrete surface. This process enables the automated production of load-bearing 3D-printed structural elements.

Advantages

- Automated production of 3D-printed walls with load-path-compliant textile grid reinforcement
- Reduction of the required concrete amount up to 85 % due to the non-corrosive textile reinforcement
- Reduction of construction time up to 50 % and construction costs up to 60 %

Status

- Patent application at the German Patent and Trade Mark Office
- We are looking for partners who will work with us to develop the technology to market maturity