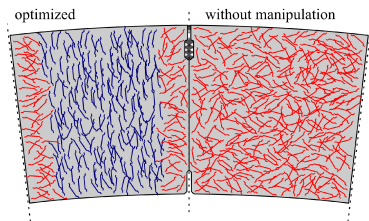


New Orientation Device for SFRC Segments

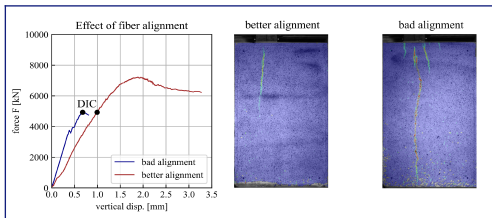
Fibers in steel fiber reinforced concrete (SFRC) improve mechanical properties of the material like the post-cracking tensile strength, crack resistance and/or ductility. However, the properties of concrete-fiber mixtures depend strongly on the amount and the orientation of the fibers. In general, the effect of the fibers is the greater the more fibers are aligned in the direction of the considered tensile stresses.



Orientation of fibers guarantees crucial mechanical properties

In mechanized tunneling prefabricated concrete elements are used to line the excavated tunnel tube. Currently these segments are made of reinforced concrete due to relevant mechanical properties. The carbon footprint of the construction could be improved without loss of stability by using steel fiber reinforced concrete with oriented fibers in critical areas such as the longitudinal joint.

- 01 Better carbon footprint due to smaller amount of steel
- 02 Faster production of precast concrete elements
- 03 Cost savings through reduced steel quantities and fewer work steps
- 04 Good crack resistance, post-cracking tensile strength and ductility values



Exemplary comparison of the load-bearing behaviour between joint bodies with poor and improved orientation of the steel fibers with identical load introduction



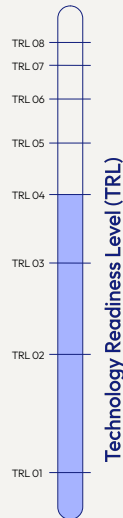
CHALLENGE

When manufacturing components with SFRC, the concrete-fiber mixture is usually poured into a mold. In the resulting component the fibers have an essentially random fiber orientation. The challenge in designing segments using SFRC consists of transferring the tensile splitting stresses that occur predominantly at the joints. A segment with non-oriented fibers cannot guarantee the necessary stability.

INNOVATION

The present invention is a fiber orientation unit that allows for an improved at least partial orientation of fibers in a preferential fiber direction, as well as easy movement of the orientation unit through a fiber-concrete mixture. The technology introduces strategically positioned grid-like alignment devices that are drawn through the concrete during the compaction phase of segment production. The cross-section can be divided into zones with predictable fiber alignment, allowing an accurate prediction of the fiber alignment in the critical areas of the device.

01 Basic principles observed · 02 Technology concept formulated · 03 Experimental proof of concept · 04 Technology validated in lab · 05 Technology validated in relevant environment · 06 Technology demonstrated in relevant environment · 07 System prototype demonstrated in operational environment · 08 System complete and qualified



An invention of Technical University of Munich



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