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PRESS RELEASE – ThinKing April 2021

The trick with the grid: How a carbon grid can impact the climate

The April 2021 ThinKing honours an innovative reinforcement for concrete construction with the potential to become a standard product in lightweight construction, thanks to the extensive process expertise of its manufacturer, solidian GmbH. solidian GRID carbon reinforcement has new dimensions and improved mechanical characteristics, and offers an optimal combination of properties for climate-friendly, resource-saving construction that make it a practical standard product for the construction industry.

The Baden-Württemberg State Agency for Lightweight Design will present the ThinKing for this innovation in April of 2021. Each month, Leichtbau BW GmbH uses this label to award innovative lightweight design products or services from Baden-Württemberg.

At a glance:

- **Lighter structures** with carbon-reinforced concrete **save tons of concrete:** Depending on the component, it is possible to save 50 to 80% of scarce resources such as cement, sand and water.
- **Carbon-reinforced concrete** **reduces CO₂ emissions** and protects the climate.
- **Improved, high-strength** carbon reinforcement ensures **resource-saving** construction.
- **Long service life** because carbon does not corrode.
- **Economical:** Low logistics cost during the construction phase and low maintenance costs over the long service life.

“Instead of eight centimetres, for instance, concrete façade panels with carbon reinforcement can be just three centimetres thick – with the same load-bearing capacity” says Dr. Christian Kulas, Managing Director of solidian GmbH, describing the impressive effects of the solidian GRID lightweight façade reinforcement.

Wait a minute – impressive? What difference do five centimetres make? A big difference, when it comes to construction. Converting this material-efficient type of construction to concrete or water saved, or the quantity of CO₂ that is not produced, then it becomes clear what an easy and important contribution lightweight construction with carbon reinforced concrete can make to protecting the climate. The lighter, thinner design saves up to 70 percent for architectural concrete.

**Carbon concrete has many advantages**

Carbon-reinforced concrete is a material with multiple advantages over traditional reinforced concrete. One of these is within the material itself: Carbon fibres do not corrode. Because of this, the concrete cover around the reinforcement can be much thinner, since it does not need to protect the reinforcement against moisture. This facilitates more streamlined components, resulting in design freedom for architects and saving huge quantities of resources.
Textile concrete, as this material is also known, furthermore stands out for its economic efficiency, since the material is also long-lasting and low-maintenance. There are even major advantages in the transportation costs for construction site logistics, since the carbon reinforcements for the precast parts made in the factory are much lighter.

Why has this construction material not already become more widely established? Carbon reinforcements have been in development for quite some time. However, until a few years ago it was not possible to manufacture the carbon grids in common standard dimensions used on construction sites, to match the previous steel reinforcements.

**Improved strength results in better material utilisation**

Today, solidian GmbH can produce the mats used for solidian GRID in a practical standard size of 2.3 m x 6.0 m. The maximum dimensions are 3.0 x 8.0 m. In the future, the company will even offer roll goods of up to 80 m in length, says Dr. Christian Kulas.

Thanks to the new dimensions, it has also been possible to significantly reduce the required number of joints between mats. This allows for more efficient use of the mat material and faster work in the precast concrete plant, since fewer reinforcement mats need to be connected.

“However, we are not only able to manufacture larger dimensions with our new process; we have also succeeded in once again significantly improving the mechanical properties – in particular tensile strength” says Dr. Christian Kulas.

To do so, the company first bundled the fine carbon fibres, then laid them out in a grid shape. Then they were saturated with epoxy resin and cured. The saturation and activation of all fibres in the grid influenced tensile strength and breaking stress.

In conventional carbon reinforcement mats, the average breaking stress is approx. 3,200 N/mm² with a scatter of around ten percent. In comparison, the new solidian GRID has a higher average breaking stress of 4,000 N/mm² with a much lower scatter of around five percent. This corresponds to around a twenty-five percent improvement in performance. In practice, it means grid spacing within the reinforcement can be larger, or the reinforcement itself can be thinner.

**Becoming a standard for lightweight construction**

The solidian team is working hard to become a standard product and be included in relevant construction industry regulations: “Currently, we still need approval for each individual case to use solidian GRID – we are working on the general construction law permits and relevant guidelines in a variety of boards. This will be a successful approach, but will take some time”, reports Dr. Kulas.

In the future, the material could result in notably lower costs as a standard. It would allow for an initial use of less concrete – meaning less cement, water, and sand, and negligible costs for maintenance and repair thanks to its significantly longer service life.

However, until the new material is well accepted in precast part manufacturing and at construction sites as a climate-friendly, lightweight mix of components, it requires not only
general approval, but also the willingness of the entire innovation planning chain to approve it and help it more forward. For solidian, this means not only maintaining a relevant product range, but also good advising for the parties involved in construction.

Dr. Christian Kulas says: “Our advantage is not only our broad product range of carbon reinforcements, but above all the extensive advising we offer architects and civil engineers, as well as manufacturers of finished parts”.

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About solidian GmbH

solidian GmbH manufactures non-metal reinforcements for concrete construction. The company's carbon or glass inserts are used when building with textile-reinforced concrete, in particular in architectural and civil engineering to ensure corrosion-free, lightweight and durable structures.

ThinKing video

We present the ThinKing to you quickly in our new video series “Lightweight design made easy.”

https://www.youtube.com/watch?v=YoC0UZnns0c
Images

**Image 1:**
solidian GRID carbon reinforcements in a practical standard size are used primarily in precast parts.

**Image 2:**
The optimised saturation of all bundled fibres with epoxy resin ensures high tensile strength and breaking stress.
solidian GRID is used in newly built pedestrian bridges in Remstal – creating the world's first integral wood bridges with textile-reinforced concrete. The unique feature of this project is that it combines the materials wood and carbon concrete, thereby extending the service life of the bridges.

solidian GRID is used to renovate and update the Barkhausen building in Dresden as carbon reinforcement for the 30 mm thick concrete façade, decorated with flowers.

Image source: Hentschke Bau GmbH
Image 5:

The underground garage of the Marquardt building in Stuttgart has been renovated. solidian GRID was the perfect solution since it is lightweight and does not corrode. Compared to conventional reinforced concrete, the thickness of the renovated concrete was reduced by half, relieving the supporting structure of the old building.

Image source: Jürgen Pollak

Source for all other images: solidian GmbH. Print free of charge. www.solidian.com

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