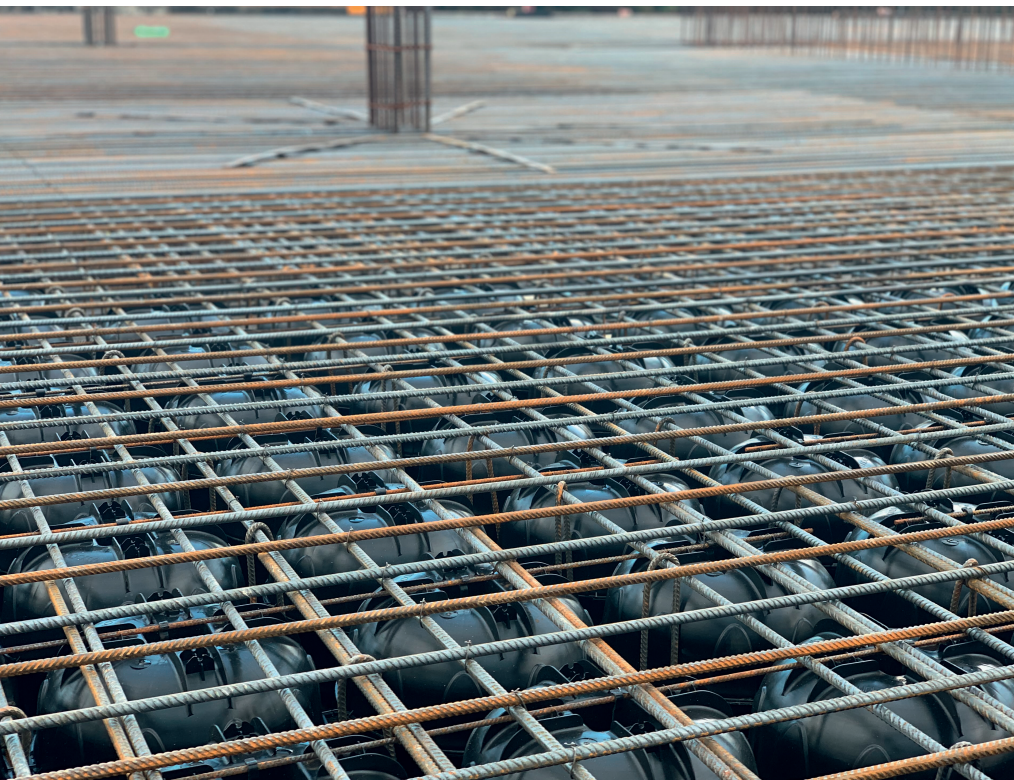


Less CO<sub>2</sub> in Construction: Plastic Displacers Replace Concrete

# Ecologically Sustainable Construction with Plastics

Construction has a considerable impact on the climate: the UN Intergovernmental Panel on Climate Change estimates that cement production generates three billion tons of CO<sub>2</sub> every year. Ecological building materials and decarbonization of concrete production only provide either partial or long-term relief. One promising alternative is the use of plastic: GS Kunststofftechnik produces hollow bodies made of recycled polypropylene in an injection molding process for Unidome Deutschland GmbH, which replace up to 40 percent of concrete in building ceilings.



The displacers are particularly useful in multistory buildings with large ceilings, balconies and foundations with thicknesses between 18 and 50 cm. With displacers, builders can reduce concrete up to 40 %. © Unidome

Concrete is one of the most important building materials worldwide. However, its production releases a lot of CO<sub>2</sub> into the atmosphere. Parts of the cement industry are working to reduce their carbon footprint by decarbonizing cement and concrete. However, there is no quick remedy in sight. The plan of the German Cement Works Association, for example, is set for 2050. Furthermore,

even ecological building materials such as wood, bricks, clay or straw cannot replace the necessary quantities of concrete that could massively reduce emissions.

Unidome Deutschland GmbH from Eltville am Rhein, Germany, is currently pursuing an approach that is already feasible today. It has developed a material-efficient lightweight construction method in which hollow bodies, so-

called displacers, are used instead of concrete at low load-bearing points of building ceilings and foundations. The plastic parts are particularly useful in multistory buildings with large ceilings, balconies and foundations with thicknesses between 18 and 50 cm. "This makes it possible to replace up to 40 percent of the concrete", explains Unidome's CEO Dr. Karsten Pfeffer, EngD.

The hemispheres are manufactured at GS Kunststofftechnik in Idar-Oberstein, Germany, and are assembled on the construction site. The system supplier and injection molding specialist produces various sizes of the Unidome XS type entirely from recycled polypropylene (rPP). The material can be molded very easily and is highly versatile and is therefore frequently used. Other advantages include its good resistance to heat, acids and alkaline solutions as well as its long shelf life, which matches the service life of buildings.

## *Hollow Plastic Bodies Save a lot of CO<sub>2</sub>*

The displacers are manufactured at GS Kunststofftechnik on a Haitian Mars III injection molding machine with a clamping force of 3800 kN. Different molds with single cavities are used for the models with varying heights of 70, 90, 110 and 130 mm. They come out of the injection molding machine as half shells with wall thicknesses of 1.5 mm.

In this form, they can be easily stacked on top of each other and transported efficiently. On the construction site, the

workers assemble two half-shells at a time and join them with a simple locking mechanism. Integrated spacers to the load-bearing reinforcement and circumferential pins for safe distance monitoring to the next hollow body ensure uniform assembly. Integrated support tunnels ensure high stability of the displacers.

Since they are hollow on the inside, the displacers weigh far less than concrete elements with the same dimensions. This means less use of cement and correspondingly less greenhouse exposure. But the CO<sub>2</sub> reduction does not stop here. Logistics also contributes its share to climate protection. A small lorry with the displacers replaces up to 48 trucks with concrete. Ideally, this means that 60 t less CO<sub>2</sub> are released into the atmosphere.

**The Displacers Make Construction Lighter, More Stable and Cheaper**

The displacers also offer several advantages for the building, explains Unidome CEO Pfeffer. Since the plastic as a building material weighs significantly less than concrete and steel, the buildings also become lighter overall – with far-reaching consequences. Pfeffer gives an example: “Ceilings can therefore be thinner or cover larger areas, which in turn means that some of the supports and beams can be avoided.” According



The Unidome displacers are manufactured by injection molding specialist GS Kunststofftechnik.

© GS Kunststofftechnik

to Unidome, up to 20 % of the previously used reinforcing steel can be omitted.

Larger ceiling areas increase the freedom in designing the floor plans. Furthermore, the structures require simpler foundations due to their lower dead weight. At the same time, the lighter, slender building structures are safer and more stable, for example, in case of an earthquake.

Moreover, the displacers help reduce construction costs. This is attributable to the lower logistics costs. Additionally, plastic displacers are cheaper than the corresponding volume of concrete.

Furthermore, the construction time can be shortened with the innovative construction method.

“With more than twenty years of experience in the development and application of hollow body technologies, we are in a position to offer the most advanced concrete molding available today”, explains Unidome’s CEO Pfeffer. References include school, research and university buildings in the DACH region (Germany, Austria and Switzerland), Spain and Palestine, a new hospital building in Passau, Germany, hotel complexes in Saudi Arabia and Kuwait, a »

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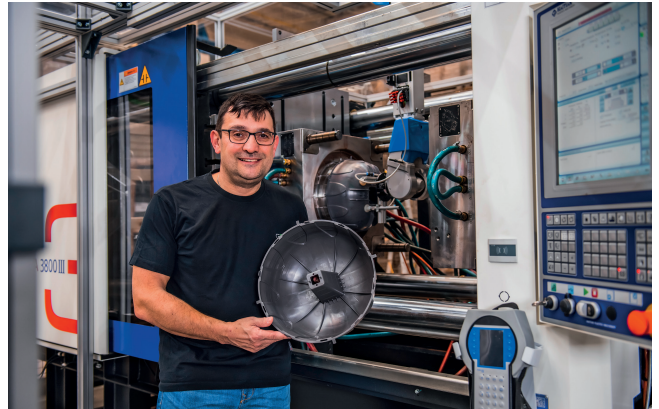
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Unidome CEO Dr. Karsten Pfeffer, EngD (second from the right) with the lightweight and stackable displacer halves. On the left next to him Key Account Manager Ameen Hafiz. © GS Kunststofftechnik



Stefan Dahlem, Process Engineering, with one half of a Unidome plastic displacer in production at GS Kunststofftechnik in Idar-Oberstein. © GS Kunststofftechnik

## Info

### Text

**F. Stephan Auch** is a freelance trade journalist and owner of auchkomm Unternehmenskommunikation, Nuremberg, Germany.

### Company Profile

GS-Kunststofftechnik – Gebrüder Schmidt KG is a system supplier and injection molding specialist with about 190 employees. Its headquarters are in Idar-Oberstein in Rhineland-Palatinate, Germany. The global customers of this contract manufacturer with in-house design department are mainly from the hygiene, sanitary, mechanical engineering, cosmetics and household appliances sectors. The company was founded in 1818 by Johann Karl Schmidt as a metal goods factory. Today it is one of the oldest family-owned industrial companies in Germany. In the 1950s, it began processing plastics. In 1996, the company, renamed to GS Kunststofftechnik, moved to its current location. It provides space for administration, construction, production and its own logistics center on a total area of 15,000 m<sup>2</sup>. Sales in 2021 reached around EUR 20 million.

[www.gs-kunststofftechnik.de](http://www.gs-kunststofftechnik.de)

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sawmill in Switzerland, a technology park in Malaga and a twelve-story office tower in Lahore, Pakistan.

### Quality Fluctuations of Recycled Material under Control

Besides the developers, the environment is the big winner – but not only because the use of displacers instead of concrete reduces CO<sub>2</sub> emissions. The rPP used for the hollow bodies also requires significantly less energy during production than new granulate. This also reduces waste because every kilogram of recycled plastic used in the displacers is one kilogram less in the environment.

Although different suppliers deliver recyclates with very different qualities, Pascal Wagner-Schön does not associate any quality issues with their use. As Head of CRM at GS Kunststofftechnik, he is the contact person for Unidome. “Our operators have no problem dealing with the

process deviations resulting from the quality variations. They’re very skilled at quickly adjusting the parameters for each new batch of granulates.” This is because the experts have extensive know-how in the use of recycled granulate. Among other things, GS Kunststofftechnik manufactures cases for reusable cotton buds made from ocean-bound plastic – recycled plastic waste extracted from the oceans.

“We’ve found the right partner in GS Kunststofftechnik”, says Unidome CEO Pfeffer with high praise. “Injection molding experience, flexibility and logistics expertise are particularly important to us for the production of the displacers.” After all, every order from Unidome must be delivered as quickly as possible in the right size and quantity. Therefore, the manufacturer in Idar-Oberstein has its own production facilities with experienced specialists as well as its own logistics center, also staffed with a competent and well-coordinated team. ■



Unidome’s displacers are injection-molded entirely from recycled polypropylene.

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