Heidelberg Materials

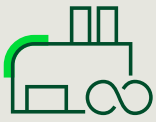
Transforming Construction with 3D Printing

Design Freedom, Construction Efficiency, and Sustainable Performance

Heidelberg Materials supports transformation of the construction industry

Heidelberg Materials drives design freedom, construction efficiency, and sustainable performance with 3D printing

The future of the construction industry demands a paradigm shift that combines sustainability with maximum efficiency and creative design freedom. At Heidelberg Materials, our goal is to transform the construction industry with our unique, high-quality 3D printing products and services. We place sustainability, innovation, and leading-edge digital technology at the core of our operations to create tailored 3D printing solutions for our customers.

Design Freedom	Construction Efficiency	Sustainable Performance
 Iconic look and unique design	 Faster construction	 Reduced waste
 Tailored performance by design	 Reduced labour costs and increased talent attractiveness	 Circularity
 Creative colours	 Versatile, reliable, and high-performing products	 Improved safety

> **Sustainability and digitalisation go hand in hand. At Heidelberg Materials, innovative and sustainable products like evoBuild 3D printable and the development of digital business models are key elements of our sustainability strategy.**
>
> **Nicola Kimm**
> Member of the Managing Board of Heidelberg Materials and Chief Sustainability Officer

3D printing vs. conventional construction

3D printing enables the design of iconic buildings faster and with fewer workers, using sustainable construction methods that reduce waste and noise. Instead of using formwork to give concrete a shape, the 3D printer achieves almost any design, such as curved walls with overhang, by printing the contours with 3D printable concrete. The printed contours act like an inner and outer shell, which is then later filled with isolation material or with structural concrete where needed. A fully automated 3D printing process allows installation of piping and electrical wiring connections almost simultaneously during printing. Conventional concrete construction uses formwork panels. Concrete is cast into and remains in the formwork for multiple days until enough strength is achieved to allow stripping. Avoiding formwork saves not only the cost of renting formwork, but also the space required on the construction site.

Design Freedom

Architects, designers, and engineers can now look beyond the constraints of traditional construction and pursue creativity with greater freedom. 3D printing technology at Heidelberg Materials makes it convenient to bring intricate and unique designs to realisation.

Iconic look and unique design	Tailored performance by design	Creative colours
High degree of freedom in designing construction elements	Easier to optimise specific building performance function (for example, thermal insulation, acoustic comfort) of the specific geographic location, shape, etc.	evoBuild 3D printable can be coloured (integrally) according to the customer's requirements

Beckum House, the first ever 3D printed house in Germany: Expanding architectural boundaries with 3D printing in construction

The two-storey single-family home in Beckum, North Rhine-Westphalia, is the first residential house in Germany that has been built with a 3D concrete printer. The house stands out with its iconic rounded corners and layered patterns, a testament to how 3D printing technology brings complex design to realisation. Achieving such complex designs with precision and fluidity is challenging in conventional construction with manual labour and use of formwork. Each layer contributes to the visual appeal of the structure, making it a canvas of creativity and design freedom. These unique designs also apply to structural components (both interior and exterior), urban furniture, fireplaces, bathtubs, and vases. It is no surprise that the Beckum House is the recipient of the German Innovation Award from the German Design Council.

KRAUSGRUPPE is at the forefront of driving innovative technology in construction. Using Heidelberg Materials' evoBuild 3D printable product not only allowed us to cut down on project timelines and resources, it also enabled intricate designs to become reality. Heidelberg Materials has been a valuable partner in pioneering the transition to modern construction methods and advancing sustainability through circular and low carbon products.

Hans-Jörg Kraus
Managing Partner, KRAUSGRUPPE

Construction Efficiency

With Heidelberg Materials' efficient 3D printing products and services, you can accelerate the completion of your construction projects. Enhance process efficiency with faster construction using less material, and by taking advantage of flexible delivery options without compromising on quality. The automated technology streamlines the construction process as opposed to a conventional multi-stakeholder construction process. The engineering and architectural office Mense-Korte ingenieure + architekten see a significant construction efficiency gain with 3D printing, such as moving from 10 – 12 months for a conventional residential building construction duration, to a reduced duration of up to 6 months with 3D printing*.

Faster construction	Reduced labour costs and increased talent attractiveness	Versatile, reliable and high-performing products
Simultaneous construction phases resulting in potential time saving of up to 50 %	From 10 – 12 workers to only 2 – 3 per house; digital job sites are appealing to the next generation of construction professionals	Performance tailored to achieve strength of structural concrete, robustness in different environments, and available locally

* Mense-Korte ingenieure + architekten

Heidelberg Wavehouse, the largest 3D printed building in Europe: A benchmark in construction efficiency

The 54 m long, 11 m wide and 9 m high building was realised with just 172 hours of pure printing time. In this project in general only two main workers and one backup worker were needed, resulting in a significant reduction of working hours.

Sustainable Performance

With 3D printing products and services, projects can significantly reduce their carbon footprint and advance circularity in the building materials industry, leading to enhanced safety and reduction of material use, natural resources, and waste. Traditional concrete waste results from returned concrete, over-ordering, truck waste, etc. With 3D printing, this additional waste is avoided due to the precise application of material onsite.

Reduced waste	Circularity	Improved safety
Waste associated with traditional concrete construction is significantly reduced through 3D printing	evoBuild 3D printable is 100% recyclable	Fewer tools and construction workers needed onsite; also reduced noise and dust

Wallenhausen House: Responsible and sustainable construction

The dry-mix mortar used in this project is 100% recyclable. It contains a low CO_2 binder, resulting in overall reduced carbon. The Wallenhausen House was built as a residential structure containing four flats on two storeys with about 330 m^2 of living space. At the time of its construction, it was the largest 3D printed residential building in Europe. A reduced number of workers and less reliance on tools contributed to a safer and more secure construction environment. In contrast to traditional construction, 3D printing construction resulted in reduced waste, dust, and noise due to its fully automated process.

Our Products

We offer dry-mix mortar products, specially developed, and optimised for 3D printing construction.

	evoBuild 3D printable NF 2mm	evoBuild 3D printable N 4mm
Max aggregate size	2 mm	4 mm
Workability time	20 min T= 5 - 30 °C	
Printing speed layer time	Medium-Fast, 3 – 20 min	
Compressive Strength 1d Compressive Strength 28d	> 10 MPa > 48 MPa	> 10 MPa > 50 MPa
Colours	Light Grey	
Aesthetics	++++	+++
Embedded CO_2	Available for specific production site	
Printer compatible	All types	

Our Services

Heidelberg Materials offers high-quality products as well as technical expertise to architects, engineers, manufacturers of 3D printers, and contractors who want to construct buildings or concrete elements using 3D printing. Our team of experts works closely with our clients and stakeholders to develop tailored solutions that align with high sustainability standards, local building specifications, and project timelines. Our quality control processes and testing procedures ensure that every batch of our material meets the standards throughout the value chain. Our services do not stop at the delivery of materials. We also provide:

Expertise on materials

- In-depth guidance on product selection to meet specific project needs
- Support for certifications
- In-depth quality control

Our brand and our network

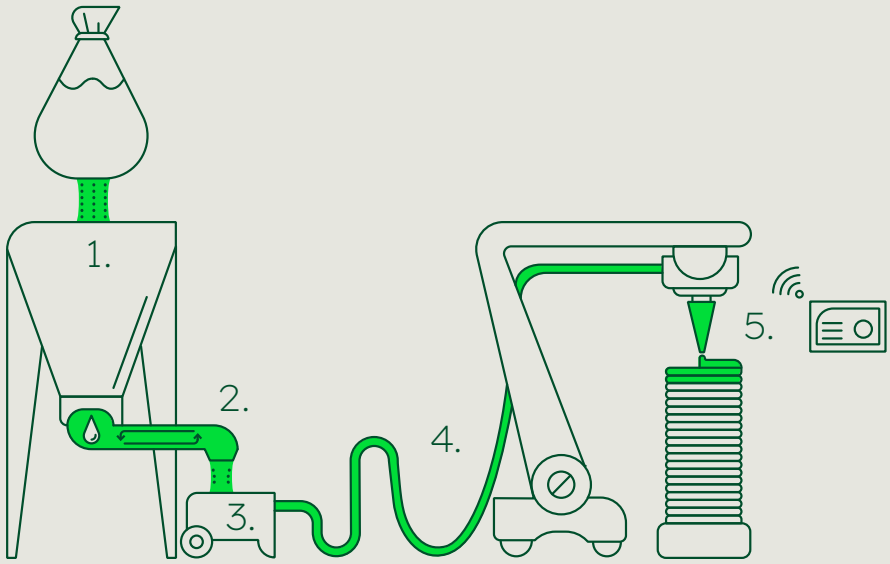
Heidelberg Materials is one of the world's largest integrated manufacturers of building materials. We have an extensive network of:

- Producers of 3D printers
- Construction companies
- Engineers/architects
- Universities

Expertise in 3D printers, pumps, and mixers

- Professional guidance for mixing and printing
- Assistance at the job site: Our products have been tested with a broad range of commercially available printer types. Our team of experts assists in the onsite printing of projects from planning to final construction

Typical printing process



1. Material loading	Our material is loaded in the storage container (for example silos)
2. Mixing	Our product is mixed with water, in the horizontal chamber, for a few seconds; the water content we recommend is reported on our technical data sheet
3. Pumping	A progressing cavity pump typically pushes the material in the hose
4. Transportation	A hose, typically 5 – 40 m long (diameter 25 – 50 mm), transports the material to the printing head
5. Printing	The structure is printed following a pre-defined printing path; different types of printers can be used (for example robotic arms, gantry systems or cranes)

For more information, please connect with us:

https://www.heidelbergmaterials.com/en/3d-printing

info3Dprinting@heidelbergmaterials.com

heidelbergmaterials.com

Heidelberg Materials AG
Berliner Strasse 6
69120 Heidelberg
Germany