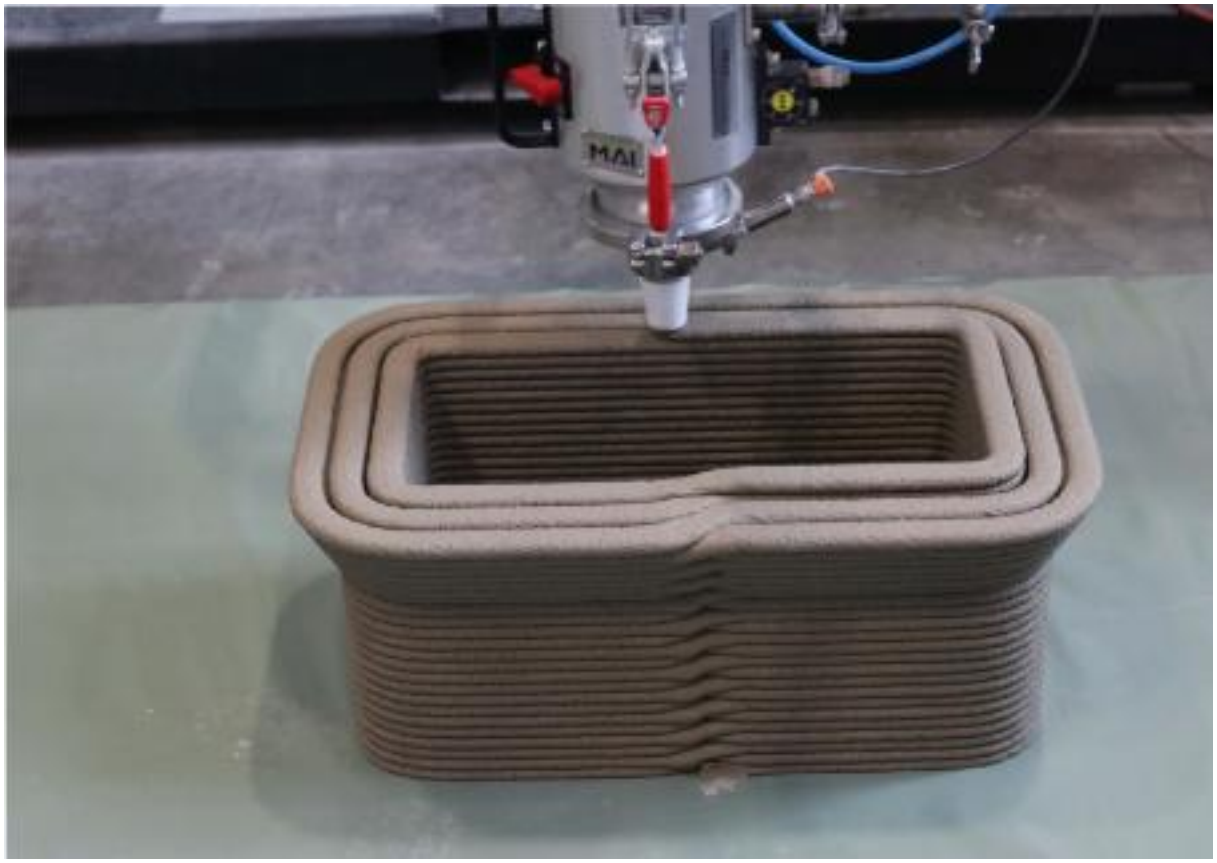
# Finding optimal building materials: concrete construction with AI and 3D printing

## About this project



### AIBetOn3D

### Finding optimal building materials: concrete construction with AI and 3D printing

**Markets:**

**Material:** Others (Concrete)

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## About this project

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Energy.

Technology Transfer Program Leichtbau

### Context

The construction industry is one of the world's largest consumers of raw materials and energy and generates large amounts of waste. A large proportion of global greenhouse gas emissions are also generated during the construction, demolition and disposal of buildings. In particular, the production of concrete - one of the most frequently used building materials - with its main component cement causes considerable CO2 emissions.

### Purpose

The aim of the scientists in the AIBetOn3D project is to reduce the environmental impact of the construction sector. To this end, they are asking themselves the overarching question of how 3D printing can be used in concrete construction to minimise CO2 emissions without compromising the quality of the construction products.

On the one hand, the researchers are developing simulation models for 3D printers with the support of artificial intelligence (AI), which should help to identify optimal building materials and combinations of building materials by enabling reliable predictions of material behaviour and potential CO2 savings. The researchers are also working on an innovative 3D printer for building materials and the associated software.

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### Procedure

As a concrete application, the researchers are looking at drainage channels and inlet boxes, which are to be implemented in different variants - in 3D concrete printing, combined 3D printing with concrete and plastic moulds and clay-based 3D printing. In addition to geometric parameters, material modifications are also being investigated.

They are developing a concept for a semantically causally correlated material production library. The AI-based algorithms and models developed are thus designed to understand the meaning of the data, analyse their relationships and recognise and use the causal relationships to enable precise predictions and optimisations. The library will contain information on novel, additively manufactured building materials and serve as a learning system to perform optimisation in terms of component dimensions, material composition and CO2 life cycle analysis. In addition, the researchers are testing the practical suitability of the developed printer and the associated software based on the specific use case.

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## About this project

**Funding duration:**

| | | | |
|---|---|---|---|
| **Funding sign:** | 03LB2041 | **Funding amount:** | EUR 1.1 million |

**Further websites** foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2041A - AIBetOn3D in the federal funding catalogue

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## Project coordination

### Contact:

Mr Josef Gramespacher

+49 07246 94550

jgr@3rs.de

### Organisation:

3RS Software GmbH & Co. KG

Daimler-Strasse 27
76316 Malsch
Baden-Württemberg
Germany

www.3rs.de

## English (EN){{ Projektpartner }}

Master Builders Solutions Deutschland GmbH

## Lightweighting classification

| | Realisation |
|---|---|
| **Offer** | |
| *Products* | |
| *Services & consulting* | |

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## Lightweighting classification

| | Realisation |
|---|---|
| **Field of technology** | |
| *Design & layout* | |
| *Functional integration* | |
| *Measuring and testing technology* | |
| **Modelling and simulation**<br>Materials, Others (AI-based process optimisation) | ✓ |
| *Plant construction & automation* | |
| *Recycling technologies* | |
| **Manufacturing process** | |
| **Additive manufacturing**<br>3D printing | ✓ |
| *Coating (surface engineering)* | |
| *Fibre composite technology* | |
| *Forming* | |
| *Joining* | |
| *Material property alteration* | |
| *Primary forming* | |
| *Processing and separating* | |
| *Textile technology* | |

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## Lightweighting classification

| | Realisation |
|---|---|
| **Material** | |
| *Biogenic materials* | |
| *Cellular materials (foam materials)* | |
| **Composites**<br>Others (Concrete) | ✓ |
| *Fibres* | |
| *Functional materials* | |
| *Metals* | |
| *Plastics* | |
| *Structural ceramics* | |
| *(Technical) textiles* | |