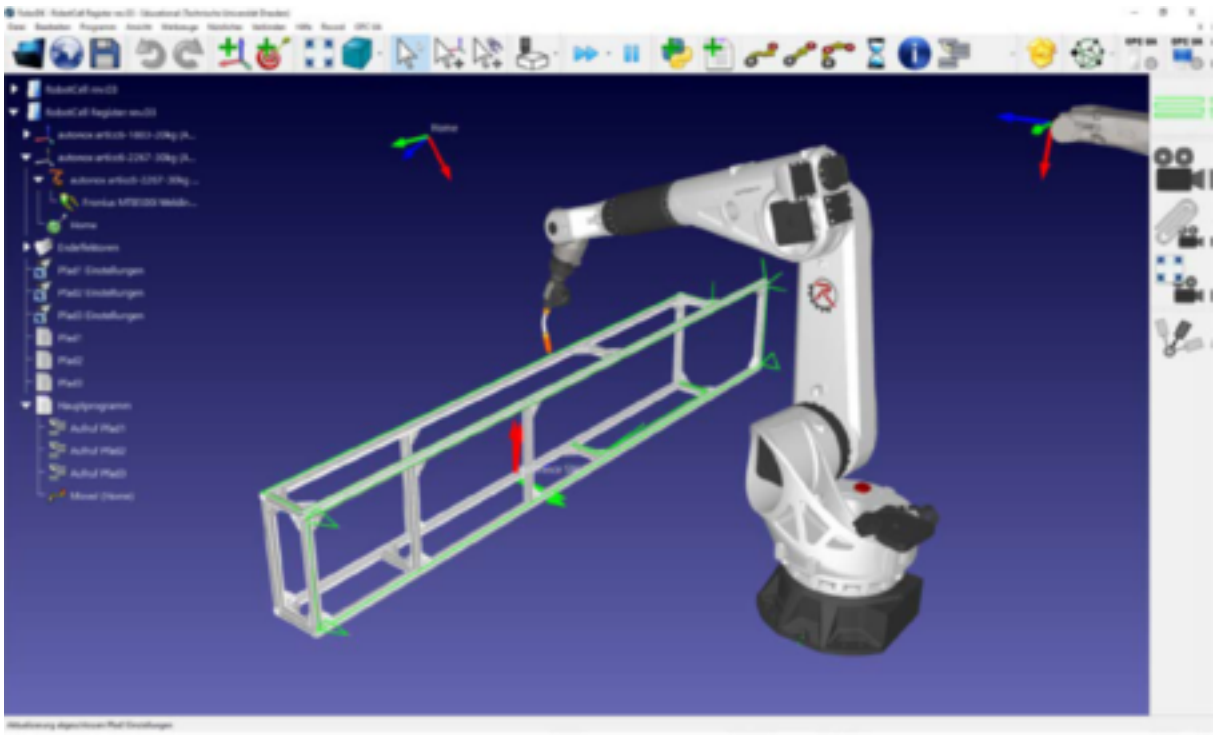
Sustainable modular lightweight buildings: resource-efficient and automated production

About this project



DigiConCyc

Sustainable modular lightweight buildings: resource-efficient and automated production

Markets:

Material: Steel

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

Technology Transfer Program Leichtbau

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Context

Buildings are among the largest consumers of energy and resources in the world. A significant proportion of greenhouse gas emissions are generated during the construction phase - due to energy-intensive materials, complex construction site processes and long construction times.

In order to pave the way to a climate-neutral building stock, new construction concepts are needed that combine energy efficiency and resource conservation with industrial production. Lightweight construction offers many advantages here: low weight, high material and energy efficiency and good recyclability. Lightweight construction can develop its full potential, particularly in modular construction - thanks to standardised processes and a high degree of prefabrication. However, to date, such buildings have mostly been produced manually and offer hardly any potential for automation.

This is precisely where the DigiConCyc project comes in. The researchers want to further develop lightweight construction in the construction industry through digitalisation and robot-compatible automation for industrial series production.

Purpose

The project team is developing a fully digitalised and automated production technology for modular, energy-efficient lightweight buildings. The aim is to create residential modules that can be flexibly adapted to different types of use and climate zones - from single-family homes to multi-storey residential buildings.

Using new, computer-aided design and computer-aided manufacturing (CAD/CAM) processes for moulding and joining techniques, the researchers want to produce complete room modules automatically in future and equip them with energy-efficient building technology.

The team wants to show that lightweight construction, digitalisation and automation can be combined into an overall system that reduces the use of materials, shortens construction times and significantly improves the carbon footprint compared to solid construction.

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Procedure

The scientists are developing a completely networked production chain. They are developing robot-assisted processes for moulding, joining and assembling the modules as well as for the automated installation of electrical cables and technical systems. At the same time, they are developing architectural concepts that combine energy efficiency, user comfort and recyclability.

A digital twin forms the centrepiece of the project: it links design data, production steps and building functions and thus forms the central development and demonstrator platform. This creates a data-based foundation for systematically optimising processes, materials and building concepts in terms of energy and resource efficiency.

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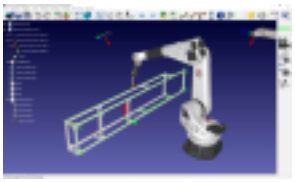

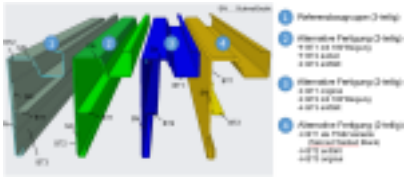

Funding duration:

Funding sign:	03LB2050	**Funding amount:**	EUR 2.4 million

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2050A - DigiConCyc in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

Metallbau Ott GmbH, Technische Universität Dresden, Institut für Mechatronischen Maschinenbau

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Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts, Software & databases	✓
Services & consulting Training, Consulting, Testing and trials, Engineering, Simulation, Technology transfer	✓
Field of technology	
Design & layout Lightweight manufacturing, Lightweight construction concepts	✓
Functional integration Actuator technology, Media conductivity, Sensor technology	✓
Measuring and testing technology System analysis, Environmental simulation	✓
Modelling and simulation Loads & stress, Life-cycle analysis, Optimisation, Processes, Reliability validation	✓
Plant construction & automation Automation technology, Robotics	✓
Recycling technologies Recycling	✓

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Lightweighting classification

	Realisation
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology	
Forming Bending, Extrusion moulding, Rolling	✓
Joining Screwing, Welding	✓
Material property alteration	
Primary forming	
Processing and separating Drilling	✓
Textile technology	
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals Steel	✓
Plastics	
Structural ceramics	
(Technical) textiles	