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FRAUNHOFER BUILDING INNOVATION ALLIANCE

PRESS RELEASE

Living spaces of the future: digital - sustainable - smart

A special show by the Fraunhofer Building Innovation Alliance at BAU 2019

Digitization, climate change, scarcity of resources and housing shortages - these trends call for society, business and research alike to change their ways. The construction industry also has to develop innovative and sustainable solutions to meet the constantly growing demands placed on buildings. It is becoming increasingly important to think in cross-industry terms and act via networks. The member institutes of the Fraunhofer Building Innovation Alliance are working continuously on interdisciplinary solutions and systems to actively shape the "living spaces of the future". With its special show at BAU 2019, Hall C2, Booth 528, the Fraunhofer alliance will be presenting innovative products and system solutions from its construction research.

Innovation Cube

The centrepiece of the special show is the walk-in "Innovation Cube" located in the middle of the exhibition area occupying a surface area of approximately 300 square meters. The two-story cube will be used to showcase innovative and sustainable insulation materials, PV strip collectors, façade-integrated lighting and resilient façade elements capable of resisting explosions. Unusual materials, such as vegan leather for architectural applications or acoustic plaster, will be demonstrated on the façades of the cube, as will the use of PCM (phase change materials) as energy storage systems or an air collector and ceiling panels for smart air conditioning inside buildings. A wall drying system and a method for virtual sampling complete the multi-faceted joint exhibit.

In the augmented reality application for virtual room sampling, QR codes are collected via an app on a tablet and the corresponding virtual building products then displayed three-dimensionally on the inside of the cube. With this technology, architects, planners or manufacturers can now test various system or product solutions on virtual models, enabling them to make well-founded decisions early on in the planning stage.

The "Innovation Cube" is surrounded by four theme areas, which are described in the following by means of selected exhibits.

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Digitization: the physical building and the digital twin

"While in other countries great efforts are already being made to exploit the possibilities of digitization to increase productivity and cost efficiency and reduce errors, the digitization of the German real estate world is still in its infancy," sums up Thomas Kirmayr, Managing Director of the Fraunhofer Building Innovation Alliance. In spite of a favourable market situation, many people in Germany are sticking to old habits and are in danger of being left behind internationally. This is one of the reasons why a number of member institutes of the Fraunhofer Building Innovation Alliance are intensively researching the extensive possibilities of Building Information Modeling (BIM). A key area of research is the "digital twin", i.e. the digital representation of a real building. These building information models can describe not only the spatial location and extent of objects, but also their technical, physical and functional properties, even linking them with simulation tools and prediction models. Thus, the digital twin also facilitates virtual planning and construction measures in existing buildings - for example, when modernizing and renovating residential buildings. It can be used to rapidly simulate changes in utilization and anticipate the effects of individual measures on such aspects as energy demand, user comfort and the environment. The data is analysed using algorithms, thus enabling predictive maintenance through the automatic display of any inventory maintenance measures required.
Similar to modeling building engineering services, complex factory processes can also be simulated in order to plan production sites. The "BIMFab Demonstrator" supports the testing of different factory planning alternatives on the basis of IFC models. This will be demonstrated on a factory model at the special exhibit.
In the joint project "Future Construction (FUCON 4.0)", integrated digital process chains for industrial construction are being researched and tested together with industrial partners. The aim is to take a close look at the construction value chain, identify innovation potential and optimize interfaces. Based on real construction projects, the research results will then be implemented in the form of prototypes. Initial results can be seen at the Fraunhofer Building Innovation Alliance booth at the trade fair.

New sustainability: materials, recycling and energy efficiency

Effective climate protection requires not only energy-efficient, low-emission solutions for building utilization, but also resource-saving construction methods and the use of sustainable building materials.
For example, researchers from the Fraunhofer Building Innovation Alliance are replacing carbon and glass fibre fabrics in textile concrete with environmentally-friendly natural fibres. This improves the carbon footprint of the concrete while maintaining the same level of performance and reducing production costs. The prototype of a natural fibre-reinforced concrete bridge will be on show at the special exhibit.
Recycling building materials is another ever-more important way of saving finite resources. Around 600 million tons of raw mineral-based building materials are used

worldwide every year. The majority of this is accounted for by primary raw materials and only five percent is recycled for construction applications and returned to the construction industry. The Fraunhofer project "BauCycle" has set itself the goal of establishing the sorting and processing of demolition materials and their return to the construction loop in an effective process. This will facilitate more sustainable construction methods and counteract the shortage of landfill space. The newly-developed optical sorting process for fine fractions (< 2mm) and building materials from the recycled waste will be presented to the public at the special show.

Smart living: user-friendly living

Smart buildings should aim to offer residents a pleasant, safe and healthy living environment - this is becoming increasingly important since modern man spends up to 90 percent of his life in enclosed spaces.
Above all, smart living therefore stands for technical processes and systems that improve living and working conditions and the quality of life in rooms, as well as a building's energy management and energy efficiency. This is achieved, for example, by means of digital, networked and remote-controlled devices and installations, but also through automated processes and components integrated into the building. As part of the "ArKol" project sponsored by the German Federal Ministry of Economic Affairs and Energy (BMWi), Fraunhofer building researchers have developed a solar thermal venetian blind for transparent surfaces. The high temperatures developing between glass panes are used to supply heat to the building's hot water storage tank via heating pipes built into the slats of the blind. This lowers both the temperature inside the room and the need to cool the building. Thus, the solar thermal venetian blind not only ensures good protection against glare and a pleasant room climate, but also reduces a building's energy requirements.
The "STARK air collector", designed for air-conditioning rooms, also functions solar-thermally. The goal is to cut electricity consumption by approx. 50 percent over the requirements for Energy Efficiency Class A.

Smart cities and resilient quarters

The United Nations is predicting that almost 70 percent of the world's population will be living in urbanized areas by 2050. To meet the rising population density and the resulting problems, as well as the growing threat from extreme weather events and climate catastrophes, cities must be appropriately adapted and protected. So-called "resilient quarters" are able to compensate for the consequences of such threats. The design of urban surfaces plays a decisive role in this. They influence, for example, whether radiation is reflected or absorbed, thus serving to cool or heat a city. In collaboration with research institutes and companies, with local authorities and administrative offices, the scientists are conducting research on the "building physics of urban surfaces". To this end, aspects and key players are brought together, current and

cross-sector information is made available, and findings and new technologies are developed. These include urban materials, surfaces and integral town components, planning tools and evaluation methods, as well as proof of suitability and the demonstration of innovative solutions.
The Fraunhofer alliance is also investigating extreme effects and the reactions of buildings, for example, to explosions or earthquakes. One of the features of the special exhibit is the model of a city that will be used to simulate extreme effects. This will involve a specially developed engineering tool for identifying risks and optimizing the protection potential.

Information on the Fraunhofer Building Innovation Alliance can be found at **www.bau.fraunhofer.de.**

Rendering of a building panorama with the developments from the ArKol project: solar thermal blind (left) and strip collector (right).
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