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Fraunhofer flagship project BAU-DNS

Getting Existing Buildings Ready for the Future

A universal modular construction system: In the BAU-DNS flagship project, seven Fraunhofer institutes are developing innovative methods for the sustainable, modular and circular refurbishment of existing buildings, aimed at industry and small and medium-sized enterprises. They will be presenting recent findings and solutions at the BAU 2025 trade show in Munich from January 13 to 17.

In Germany, around 40 percent of all CO₂ emissions stem from the construction and operation of buildings. In fact, new buildings hardly pose any obstacle to achieving the German federal government's climate policy objectives. Existing buildings are another story. At the current rate of renovation in Germany, modernizing them appropriately would take nearly a century.

Against this backdrop, seven Fraunhofer institutes have teamed up to work on the BAU-DNS flagship project. Their stated aim is to redesign Germany's existing buildings to pave the way for the future — and to do it quickly and with minimal use of resources in every way.

The research teams responsible for the project are not primarily interested in developing individual projects. They are synthesizing their subject-specific approaches and expertise to develop a modular system that the construction industry can use on a customized basis to quickly bring existing buildings up to speed for the future, from building surveying and documentation to fabrication and beyond to implementation in the field.

Resource efficiency from building surveying and documentation to implementation

As things currently stand, every building has its own requirements, outdated construction plans and the complexity of existing structures make renovations more difficult, plus there is a lack of skilled workers. "The situation means we need to use data from end to end, design processes for sustainability and fabricate construction elements to be simple and easy to install," says Dr. Simon Schmidt, head of the Hygrothermics department at the Fraunhofer Institute for Building Physics IBP, explaining the key con-

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cerns the researchers are trying to address. In terms of materials, the teams are focusing on recycling and on local availability. Their solutions are also climate-friendly and made to last.

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The experts hope to optimize the renovation process through high levels of prefabrication and automated planning. "We think it's important to ensure that small and medium-sized enterprises in particular can use end-to-end processes from building surveying and documentation through to implementation that they can integrate seamlessly, without all the individual handoff points where information gets lost. The more planning and thinking takes place in advance, the simpler the surveying and documentation, fabrication and installation steps end up being," Schmidt says.

Overarching expertise for end-to-end processes

One key challenge consists of being able to directly target companies' specific issues and concerns going forward and join forces with them to explicitly pursue further research as needed, with the ability to go into depth quickly.

To make sure their modular system contains the right elements to cover this entire range of needs, the Fraunhofer experts are also going beyond the specific institutes involved to work closely with a large number of partners from the research sector and industry. "Our goal is to reshape the construction industry for greater sustainability. To achieve that, our concepts and solutions need to adapt flexibly to specific requirements and be available on a broad basis," Schmidt notes.

Facades done right

From surveying and documenting a building to digitalizing the data and through to fabrication and logistics, the experts show that their modular principle works based on a sample process they will be presenting at the BAU trade show in Munich in January 2025. A test building on the grounds of Fraunhofer IBP in Holzkirchen is already equipped with active facade modules with bio-based insulation and built-in solar panels.

The researchers are also developing a handheld measuring system that collects and analyzes building information in real time. The team is scheduled to present how the data generated in this way is used to create a broadly usable information model, along with building-integrated photovoltaic (BIPV) modules and many other findings and solutions from the BAU-DNS flagship project to attendees at the BAU 2025 trade show in Munich from January 13 to 17, where the Fraunhofer-Gesellschaft will be exhibiting at Booth 528 in Hall C2.



DNA strand of the integral construction process

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