Glass-foil roofs save resources: modular translucent roof system

About this project

Light-Light-Roof

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Markets:

Material: Laminates

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

Glass roofs span railway stations, leisure pools and shopping arcades. This translucent overhead glazing is usually made of several panes of insulating glass. What appears light and bright is actually heavy and consumes a lot of resources. This has a detrimental effect on the overall construction, material transport and installation. Lighter film-based materials, on the other hand, are still being trialled today. An integrated overall system is missing.

The project partners are developing an innovative, lightweight and modular lightweight construction system for translucent roofing. To this end, they are combining a modular glass-foil system with an inner roof made of a mobile, translucent and IR-reflective fabric. The modular system consists of ETFE film covering (ETFE: ethylene tetrafluoroethylene copolymer) and toughened safety glass. ETFE is now permeable to up to 95 per cent of light. These building envelopes are becoming increasingly important in architecture in particular, as the materials are better characterised and it has been possible to overcome production-related obstacles through bonding and welding, for example. Prominent examples of the use of ETFE are the "Allianz Arena" in Munich and the "Water Cube" in Beijing.

Purpose

The project team calculates that the translucent roof system made of glass and foil will weigh 75 per cent less than conventional roof coverings with triple insulating glass. This results in CO# savings of up to 29.2 kg per square metre of surface area for the Light-Light-Roof lightweight construction system. In horticulture and the plant trade, the project partners are forecasting a CO# reduction of over 1.4 million tonnes in ten years for Europe-wide "production under glass". In addition, there are further, as yet unquantifiable savings in building construction: for example, architects could design slimmer and lighter buildings, as the load-bearing structure would have to bear significantly less weight. In addition to the plant trade, Light-Light-Roof is also interesting for other markets, such as the construction of shopping arcades, railway stations, leisure pools, hotels or building facades.

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Procedure

The project partners create a prototype that they test under real conditions. In a representative environment: in the "Altmarktgarten Oberhausen" rooftop greenhouse, they are investigating the glass-foil roof in various material combinations on a roof area of 40 m² in year-round operation. The "Altmarktgarten Oberhausen" is a building-integrated rooftop greenhouse with its own research and development area. It is a flagship project of the federal programme "National Urban Development Projects" and thus attracts a great deal of attention. In addition, the system is being demonstrated and analysed for use on façades at the Fraunhofer UMSICHT site.

The project team is installing a sensor network in the rooftop greenhouse in order to investigate and visualise the light and climate management of the overall system. In addition to visualising the entire database, various sub-visualisations are created that provide insights into the temperature and humidity behaviour of the individual levels. In addition to a clear data evaluation, this visualisation is primarily used for demonstration purposes. Interested parties can clearly and intuitively understand the operating behaviour of the system when environmental parameters change, such as the opening and closing of the vents. The project team is particularly focussing on the expanding market for production systems located in urban areas.



Funding duration:

Funding sign:	03LB4007	**Funding amount:**	EUR 541 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB4007A - Light-Light-Roof in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Systems and end products	✓
Services & consulting	

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Hybrid structures, Lightweight material construction	✓
Functional integration Sensor technology	✓
Measuring and testing technology	
Modelling and simulation Life-cycle analysis	✓
Plant construction & automation	
Recycling technologies	
Manufacturing process	
Additive manufacturing	
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 Laminates	✓
Fibres	
Functional materials	
Metals	
Plastics	
Structural ceramics	
(Technical) textiles	