

2018 HIGHLIGHTS

Task 56 – Building Integrated Solar Envelope Systems for HVAC and Lighting

THE ISSUE

In the residential sector, solar thermal and PV systems are typically placed on building roofs with limited attempts to incorporate them into the building envelope thus creating aesthetic drawbacks and space availability problems. On the contrary, the use of facades is highly unexplored, and daylight control is delegated to individual management of blinds and curtains leading to high thermal loads during mid-seasons and summer.

In the tertiary segment (offices, schools, hospitals), the roof is again, most of the time, the only surface devoted to the installation of solar thermal and PV technologies. While daylight control here is state of the art in terms of shading effect, the utilization of shading devices to redirect natural light into the room thus improving visual comfort still needs further work.

When energy efficient technologies are installed together with traditional ones, frequently they are just “added on top” of the main systems, resulting in high investment costs and low-performance optimization. An interesting option to overcome this competition is to combine multiple functions in envelope components thus enabling hybrid systems to simultaneously cover different energy, comfort and aesthetic needs.

OUR WORK

The Task's scope is to prepare an overview of multifunctional solar envelope products and systems that are available or near to market, analyzing the conditions for their effective market penetration and discussing these factors with relevant stakeholders, such as technology providers, consulting offices and architects.

SHC Task 56 focuses on simulation, laboratory tests and monitoring of multifunctional envelope systems that use and/or control solar energy, influencing thermal energy demand, thermal energy consumption and comfort of the building.

The strategic objective of Task 56 is to coordinate the research and innovation effort taking place within the scientific community and the private sector towards a wider utilization of envelope integrated technologies.

Participating Countries

Austria

Canada

Denmark

Germany

Italy

Netherlands

Norway

Slovakia

Spain

Task Period

2016 - 2020

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KEY RESULTS IN 2018

SWOT analysis

The analysis of the state-of-the-art of building integrated solar envelopes has been coupled with the SWOT study of the same solutions. This assessment is carried out on the one hand by evaluating product-related features such as unique selling points or possible improvements of a specific product/technology, and on the other hand by looking at the market for identifying existing competitors and stimulate strategies for future developments.

The report includes an analysis of 15 very different products. To build a more representative study, Task participants decided to distribute the document to relevant experts and manufacturers in the sector (not active in the Task) for them to further contribute to the elaboration of the analysis.

Systems simulation

The Task partners are working to develop planning tools to use during the initial building design phase to easily predict technologies' performance when integrated in different building fabrics. To do this, partners simulate the interaction of the multifunctional solar envelopes with buildings' heating, cooling and ventilation systems, and their impact on thermal and visual comfort.

The reliability of each model has been validated with respect to a number of simulation tools (i.e., TRNSYS, Energy+, DALEC and Matlab) and the procedures for their use, allowing for fair comparison of simulation results, have been reported in detail.

Additionally, for geometrical and user-behavior boundary conditions, a set of Key Performance Indicators have been defined for the energy, environmental and comfort assessment of solar envelope systems.

The lessons learned from this analysis will be used to elaborate on simplified algorithms to be included in the planning tools.

Industry workshops

Since industry is key in developing new technological solutions, manufacturers are involved in the Task work, mainly during the biannual Task meetings.

During the Task meeting in Montreal, Canada in September 2018, an industry workshop was organized that brought together BIPV-BIST manufacturers, large utility companies and Canadian associations. Manufacturers presented their latest developments of building integrated solar technologies, while barriers and market opportunities were discussed in a round table.

In a second session, participants discussed how BIPV can help utilities offer new services to customers while improving grid management and reducing buildings' thermal load peaks.

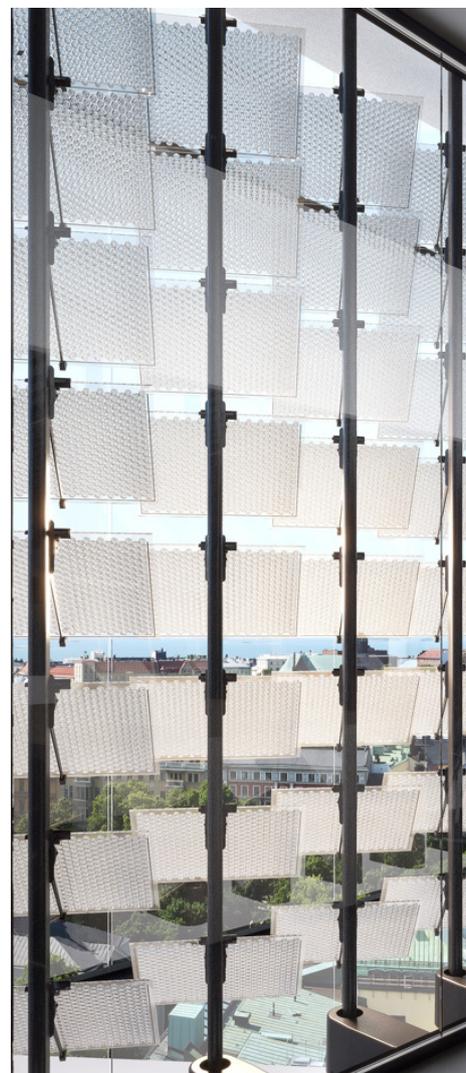


Figure 1. LUMIDUCT. Source Eindhoven University of Technology