SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

2019 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.

Participating Countries

Austria
Canada
Denmark
Germany
Italy
Netherlands
Norway
Spain

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 broader utilization of envelope integrated technologies.

Task Period	2016 - 2020
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TASK 56

KEY RESULTS IN 2019

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 was carried out on the one hand by evaluating product-related features such as the possibility for architectural and building integration, 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 analysis was first performed within the Task expert group and later extended to partners and companies not active in Task 56 in order to widen the range of solutions and experiences gathered in the study. The state-of-the-art analyses now include a total of 30 contributions, 15 of which were submitted or revised by external experts or manufacturers. Starting from this study, it was possible to describe common threats and opportunities as well as future trends of solar envelope systems. The results are documented in the report, State-of-the-Art and SWOT Analysis of Building Integrated Solar Envelope Systems.

Systems Simulation

The Task partners are working to study solar envelope solutions for office and residential buildings using building and system numerical simulations.

In the first instance, the reliability of reference models was validated for a number of simulation tools (i.e., TRNSYS, Energy+, DALEC and Simulink) and simulation procedures that allow a fair comparison of numerical results were defined. Representative Key Performance Indicators were identified for the energy, environmental and comfort performance of solar envelope systems.

Afterward, the Task partners worked on the assessment of the performance of a range of solar envelope systems (including BIPV, BIPVT and BIST systems) using the common referenced boundary conditions. The simulation campaign is on-going and partly concluded.

The lessons learned from this analysis will be used to draw guidelines for the design of solar envelope systems.

Industry Involvement

The involvement of industry is key for the development of new technological solutions. For this reason, product manufacturers were called to contribute to the state-of-the-art analysis of solar envelope products bringing their own on-field experience.

In addition, industry workshops have been organized during the biannual Task meetings to create valuable occasions for sharing views and ideas coming from different perspectives.

During the Task meeting in Copenhagen, Denmark, in March 2019, an industry workshop was organized in collaboration with “Smart Energy Green Cities,” bringing together a total of 22 experts, including architects, urban planners, manufacturers and utility companies.

Liquid Crystal Switchable Windows. Source: Merck