SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

2017 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

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 the utilization of envelope integrated technologies by:

- Gathering relevant information on market available and “under-development” solar envelope systems both in terms of performance and costs.
- Assessing test methods and simulation models for the performance characterization of solar envelope elements.
- Developing design and installation guidelines for solar envelope systems, accounting for technological, architectural/aesthetical, economic, financing and customer acceptance viewpoints.
- Assessing and elaborating on business models for solar envelope systems.

Participating Countries

Austria
Canada
Denmark
Germany
Italy
Netherlands
Norway
Slovakia
Spain
Sweden

Task Period 2016 - 2020
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TASK 56

KEY RESULTS IN 2017

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

SWOT Analysis

This is being accomplished through a number of different activities. On the one hand, by gathering relevant information on solar envelope systems in terms of energy performance, reliability and duration, architectural integration and costs. And on the other hand, assessing and categorising tools available and opportunities offered by numerical simulation models and laboratory test methods for performance characterisation of solar envelope systems. Moreover, the barriers encountered by manufacturing companies for example due to the large variability and inhomogeneity of construction standards over different countries are evaluated and suggestions for improvement are being elaborated.

Simulation and Monitoring

The Task partners are also 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 and monitor the interaction of the multifunctional solar envelopes with buildings' heating, cooling and ventilation systems, and their impact on thermal and visual comfort. The lessons learned from this analysis will be used to elaborate 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 periodic Task meetings.

A first industry workshop was organised during the Dublin meeting in March to discuss opportunities and hurdles involved in the solar integrated multifunctional envelopes.

A second workshop was organised in Eindhoven in September. Six international experts met to discuss their most innovative technologies. The presented technologies came from all areas of solar building envelopes: from building-integrated photovoltaics and solar thermal to innovative daylighting concepts and technical building plant.