



A dynamic thermal system for reducing energy demands in buildings

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THE TECHNOLOGY

The invention DARWIN-PCM is a new dynamic thermal system to be used in buildings to minimize their energy consumption for space heating and cooling.

The invention can be implemented in any sort of building envelope including walls, floors, roofs, fenestrations, and doors. It is composed of several layers of materials, one of them is mobile and contains a material with capacity to absorb and release high amount of heat - such as phase-change materials (PCM).

An example is the use of the DARWIN-PCM system as a façade structure. During the day, the PCM layer is exposed outdoors to capture and store solar radiation whilst by night, it is placed indoors to release the absorbed energy to provide comfort to occupants. This system works cyclically and allows the building to optimize its bioclimatic behaviour.

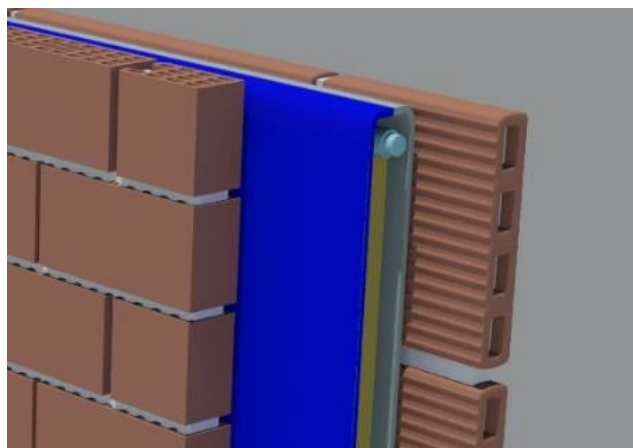


Figure. DARWIN-PCM system

THE MARKET NEED

The world's buildings accounted for 40% of global final energy use and 33% of all greenhouse gas (GHG) emissions. Under business-as-usual projections, use of energy in buildings globally could double or even triple by 2050.

In the Energy Roadmap 2050, the EU has set itself a long-term goal of reducing greenhouse gas emissions by 80-95%, when compared to 1990 levels, by 2050.

ADVANTAGES

- > Significant energy savings: When compared against conventional static systems with or without PCM, the DARWIN-PCM reduces dramatically the energy demand both on winter and summer.
- > Envelope as space heating and cooling supplier: DARWIN-PCM changes the age-old concept that building envelopes have to be designed to act as a thermal barrier and protect indoor spaces from outdoor conditions.
- > Offers unique aesthetic and commercial options: When implemented in glazed systems, the movable layers can be coloured and distinguished between parts with and without PCM.

APPLICATIONS

This structure is ideally a physical separator between the interior and exterior of the building. However, this building envelope structure could be used totally or partially in walls, floors, roofs, fenestrations, and doors.

LEVEL OF DEVELOPMENT

This structure was tested by computer modelling in two different environments: winter and summer conditions, using an increasing percentage of PCM in the thermal structure. The numerical proof of concept showed the high potential of this technology to reduce energy consumption for both space heating and cooling applications

Operating principle <https://youtu.be/lbSkvUKlaxs>

Outdoors https://youtu.be/ILS_yJkXpLU

Indoors <https://youtu.be/l9JlkbUpQLk>

IP RIGHTS

Spanish patent filed

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