MODULAR MULTIFUNCTIONAL CLIMATE-ADAPTIVE FAÇADE SYSTEM

The climate-modular multifunctional façade system for retrofitting applications has a parametric structure that allows tailoring the façade features depending on: (i) climate conditions (ii) building functions (iii) local building code (iv) and heritage constraints. The main developer and owner of the technology is ACCCIONA Construction (Spain), in collaboration with partners EURAC and SUNPLUGGED.

TECHNOLOGY

Multifunctional façade energy prototype installed on the laboratory building of ACCIONA in Sevilla (Spain)

Façade prototype system with the motors installed and connected under monitoring

USE

The façade has a light weight sub-structure and allows fast assembly possibilities, but also gives the unique opportunity to adjust the system to local climate conditions and to urban characteristics through its flexible and modular system.

Some features of the technology include the adequate proportion between the opaque and transparent surfaces, shading systems to control and exploit solar gain, thermal storage, RES integration, single and double skin systems with proper air gap integration and giving ventilation possibilities.

This creates a façade concept that can function actively or passively, through the management of climatic factors and exploitation of local sources.

FEATURES

The façade structural-system core behaves similarly to a curtain wall, allowing flexibility when incorporating strategies or technologies. This main structure, as part of allocating weights and loads of all technologies integrated, must be in charge of breaking the thermal bridge, eliminating the heat flow between the system's outside and inside.

On the other hand, the elements that make up this structure must be completed with a mechanical solution, as standardised as possible, with the fixing system attached to any of their edges. This fixing system should include different connector's adaptations for the usual elements found in a façade system, such as windows, corners, roof trim, etc. On top, it must also provide solutions for the final ends of the joint, obtaining hidden solutions, semi-hidden or visible.

Strategies to integrate the solutions were proposed after analysing what the main concept of the façade system should be to be able to adapt to the different retrofitting project needs, with an energy-positive impact.

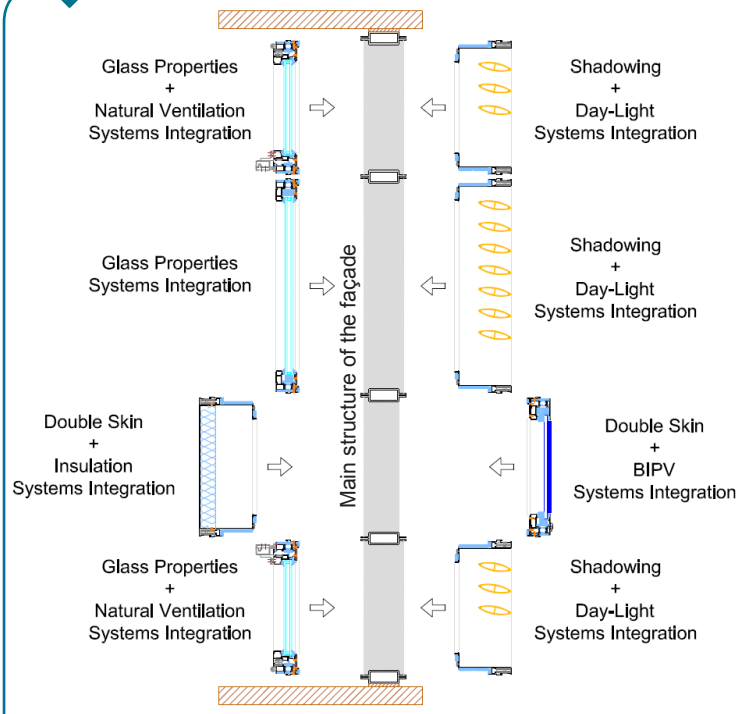
Within the strategies for slightly colder climates, the selected solutions included passive solar systems that allowed reaching the interior comfort parameters as well as the modification and configuration of different glasses, allowing the optical characteristics to adapt to different climates. With this system, any modular configuration can be reached, distributing sizes and setting the multiple glasses in different positions, inside or outside the system according to the requirements. A double skin of glass can also be planned, depending on the needs of thermal insulation or solar control of the radiation.

For natural ventilation, solutions contemplating the duplication of profiles were proposed, uprights or crossbars, to set the location of folding glass sheets allowing the flow of indoor / outdoor air. With this system, the folding areas could be located at any height, depending on the location or direction of the estimated airflow. A quite flexible and adaptable solution.

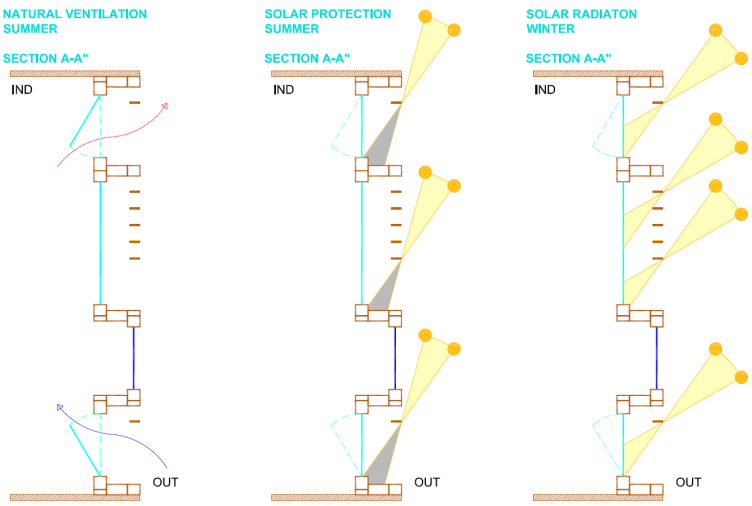
In continuation, for solar protection, integration solutions included:

- The implementation of horizontal or vertical elements in the outer part of the system (with different lengths and widths according to the different local solar situations and climates).
- The possibility of increasing the number of the horizontal profiles or crossbars of the façade system itself, adaptative depending on high or low solar requirements. This solution can be combined with natural lighting strategies (varying in materials or finishing), which reflect in greater or lesser measure the solar radiation into the building. The possibility of integrating the photovoltaic technology as a shading element was also analysed.
- Finally, opaque solutions were proposed. Those can incorporate thermal insulation solutions (with different material), located in the space between the structural system profiles, with different exterior and interior finishes. The variant to this is a combined use of pcm in both the insulation and the interior finish layers (solutions that are easily integrated into the façade system).

HOW IT WORKS



Multifunctional façade energy concept design scheme



Different functions for strategies on natural ventilation and solar protection scheme

INNOVATIVE POTENTIAL

The system allows integrating and exploitation of energy efficient technologies, increasing the energy potential of the façade retrofitting and allowing reducing the future energy demand. The system is communicating with the building management system iBEMS (see separate flyer), working as a high-level controller, increasing the system energy effectiveness and adaptation to particular climatic conditions along the day, week, month, year.

It can also allow energy exchange between systems and using the energy losses of other building systems.

BENEFITS

- Energy savings
- Cost savings in building exploitation.

The system is currently monitored in laboratory conditions, the final impact potential will be presented by end of 2017.

CASE STUDIES

Test Cell laboratory of ACCIONA Construction in Sevilla (Spain), on-going monitoring.

COMPATIBILITY WITH OTHER TECHNOLOGIES

Yes, depending on climate location and building façade typology. See more information in the "features" section.

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The project CommON*Energy* (2013-2017) focuses on transforming shopping centres into energy efficient buildings, by developing smart renovation strategies and solutions to support their implementation as well as assess their environmental and social impact.

- 3 demo cases, 8 reference buildings & 23 partners from across Europe
- 25 technologies developed and installed in 4 years
- Up to 75% reduction of energy demand, leading to costs reduction
- A payback time of maximum 7 years

CommON*Energy*

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WWW.COMMONENERGYPROJECT.EU