More than a façade

Building industry is still chasing the dream of fully transparent glass facades. Currently available technologies are in clear contradiction to the main purpose of a fully glazed facade: The clear and unobstructed view from the inside into the outside environment. The main reason is the inevitable requirement of solar protection to avoid solar heat gains and consequently high cooling loads in buildings. Solar coatings, tinted glass, switchable windows and classic interior and exterior sun shading devices all have the same general effect: The quality of the views to the outside is reduced.

Existing WFG façade in Cuenca, Spain

Within the framework of the European research program HORIZON 2020 the project InDeWaG (Industrial Development of Water Flow Glazing Systems) has been funded by the European Union. During the funded period of three and a half years an international consortium incorporating research institutes, industry and designers is developing a new insulation glass unit. In the cavity of this unit a water-glycol mixture is circulating. Due to the spectral properties of water it captures most of the infrared solar radiation: it is transparent to visible wavelengths of the sunlight but opaque to NIR wavelengths. Moreover, water flow glazing has the same natural light transmission as conventional glazing whilst reducing the heat transfer towards the interior space. Furthermore, the water circulation allows to use, store or dissipate the energy captured by absorption of the water filling the cavity

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Buildings design for new highly energy performing buildings

InDeWaG

Industrial Development of Water Flow Glazing Systems

Fluid Flow Glazing for Façade & Interior Radiant Heating and Cooling Wall Systems

Nearly Zero Energy Building (ZEB) performance levels will become a "must" for new buildings in Europe by the end of 2020. The goal will be reached by introduction of new, disruptive building envelope systems which enable significant cost reduction for multiple types of ZEB in different climate zones.
InDeWaG aims at technical innovation which will bring to industrial ripeness a facade and interior wall system based on radiant heating and cooling glass surfaces made from water flow glazing (WFG), which harvests solar energy for various uses.

www.indewag.eu

Water Flow Glazing Technology

The Water Flow Glazing technology is the essence of the InDeWaG project, leading to a multi-layer architectural and technological advantages:

- maximum use of daylight
- NZEB Performance
- standardized building components
- minimum HVAC expenses
- no need for conventional sun-shading
- full transparency
- full daylight autonomy
- reduced solar radiation

Façade system advantages:

- Easy mounting and maintenance frame-in-frame design
- Standardized system components
- Complete System Modularity
- Suitable for up to 1300 x 3000 x 86 mm Triple glazing units
- Developed to meet the NZEB performance
- Compatible with the InDeWaG Water Flow Glazing technology, leading to radiant cooling and heating with minimized HVAC consumption and eliminating the need for conventional sun-shading

Demonstrational Mock up - Spain

In order to evaluate the thermal performances of the water flowing glazing in comparison with a double glazing solution, a scale mock-up formed by two cabins: a WFG cabin and a reference cabin was built in Spain.

The prototype consists of a steel structure of dimensions 1.5 x 1m, mounted with rotating wheels with brake and anti-tip buttress to make it mobile.

The prototype is divided into two levels: the main level and the bottom level.

The main level is built with 100 mm XPS opaque panels in all its facades except the south which is composed of two glazing: Reference glazing (1x0.5m) and CoolGlass glazing (1x0.5m). The bottom level is built with 100 mm XPS opaque panels, allows the primary and secondary water circuits to be housed as well as the monitoring and control system. This solution gives the prototype its own autonomy. The interior wall between both cabins is also 100 mm XPS opaque panel in order to keep the rooms thermally insulated

Energy strategies as well as construction and production processes are being validated through extensive testing and monitoring of the Spanish prototype under real conditions. It is the starting point to validate the whole WFG concept through monitoring and the use of controlling system. The main strategy of this mock up is to reject solar energy by means of the CoolGlass module (type of WFG module) and achieve high levels of comfort in the interior of the cabin.

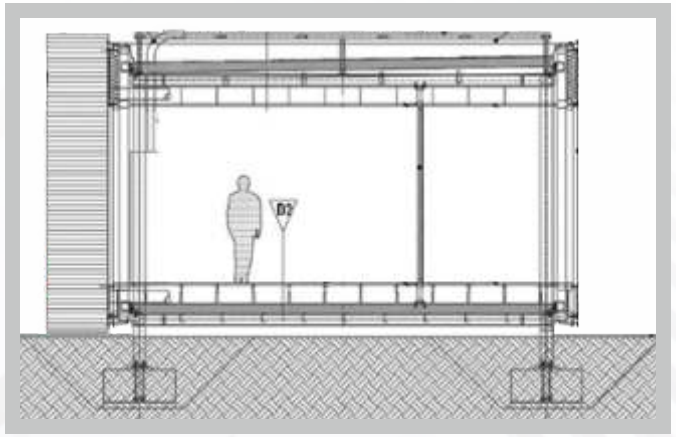
The gathered data has been analysed and compared to the acquired results from the InDeWaG software tools. Very little deviations between the simulation and the real performance have been registered

Demonstrational Pavilion - Bulgaria

In addition to the Spanish demonstrational mock up, a continental climate demonstrator will be built in Bulgaria. It will be a demonstrational pavilion which is planned to be constructed in 2019 at the Bulgarian Academy of Sciences in Sofia. WFG elements will be installed on the entire eastern, western and southern facades and on interior walls used for additional radiant heating and cooling. The building will allow extensive monitoring and thus provide valuable information for both the calibration of the simulation tools and the operation and durability of the modules.

The pavilion has a square base with a side length of 7850 mm and a height of 4750 mm.

The demonstrator will have a heating ventilation and air-conditioning (HVAC) system in order to evaluate and to demonstrate the ability of the water flow glazing system to be integrated into conventional air conditioning concepts. In this way, the internal conditions can be controlled precisely and the effect of the WFG façade will be studied in an accurate way.



East, south and west facades are transparent with some opaque modules made by WFG. North façade is fully opaque and contains the entrance door and the HVAC block. The interior of the pavilion is single volume space with radiant heating/cooling WFG partition walls inside. The cooling and heating needs of the pavilion are covered by WFG glazing technology. The total area of internal WFG walls is 19m². Floor structure is designed with PUR sandwich panels, which support raised installation floor. Roof structure is also designed with PUR panels elements covered with PVC waterproofed membrane. It sustains conventional false ceiling with integrated LED lighting. A roof-mounted photovoltaic system will cover the electricity demand of the Pavilion and assist in achieving Nearly Zero Energy Building standard