NEWSLETTER
Issue 2.1, November 2017

Horizon 2020 Research and Innovation Action – InDeWaG Project

Modular Unit Façade Concept

Description of Fluid flow glazing module

Based on construction and architectural design trends and due to its unique characteristics the fluid flow glazing - FFG module is a product of the future. It is a vertical-shaped modular unit which consists of a triple glazing sized 1.3m x 3m (one fluid chamber and an argon chamber), a circulator allowing fast flow rates of 8 l/min per window, and a modular aluminum frame that encloses the glazing and the circulator. FFG is a combination of: Active Façade with integrated Monitoring and Control System, Radiant Panel providing cooling and heating, Transparent solar collector, Sunlight protection window and/or an Internal Partition wall. Each module includes own circulator and heat exchanger making the separate FFG elements independent from each other. From installers point of view such modular system reduces drastically the installation and maintenance costs for the whole façade. Thanks to its versatility and unique features WFG is considered to be on the competitive edge in the energy efficient windows market.

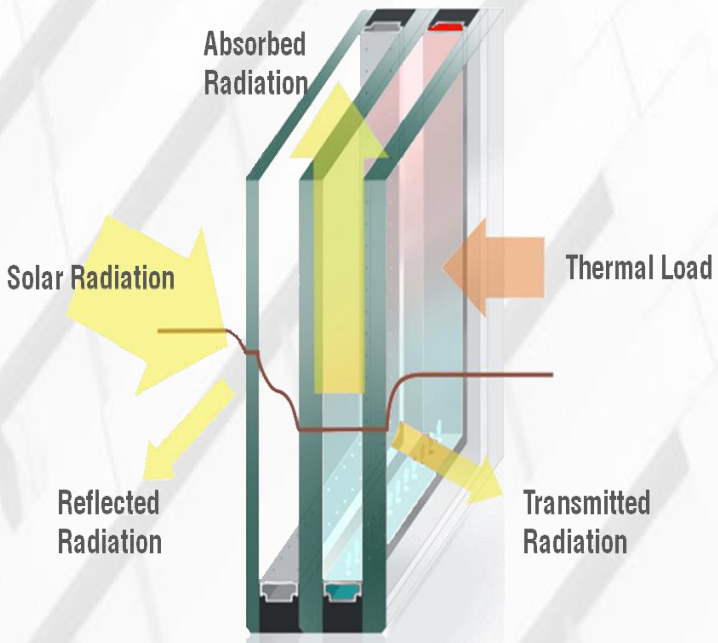
This technology developed within InDeWaG project is economically viable and leads to minimization of building's heating and cooling demand.

A fluid flow glazing façade comprises of separate FFG modular units that can easily be connected to one another or replaced in case of being damaged.

Characteristics of a single Modular Unit:

Vertical-shaped window

- **Dimension: 3 x 1.3m**
- **Flow rate: 8l/min**
- **Tripple glazing**
- **Fluid chamber: 24mm**
- **Argon chamber: 16mm**
- **Separate heat exchanger and circulator in every unit**



Principal concept of operation

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The technology for industrial production of the FFG elements passed through production of demo samples for laboratory tests and was further developed and used to assemble test samples with dimensions exceeding one square meter. Next upcoming steps are production of real size FFG elements as well as further industrialization of the manufacturing processes.

Aesthetic High Performance Façade

To realize a future product attractive for architects that meet the requirements of the current and future office buildings, the modular panels of FFG help to achieve nZEB requirements. The FFG façade enables light transmission, energy savings for heating and cooling, reduction of investment costs through scaling down the heating ventilation and air-conditioning system of the building, sustainability by using renewable energy sources, comfort thanks to radiant heating and cooling. Added value features of FFG compared to other façade solutions are numerous - façade providing heating and cooling, reduced need for shading, great visual and thermal comfort, efficient heat transfer and easy installation.

InDeWaG façade is unitized and can incorporate an existing HVAC system. Its "modularity" consists in the independence of every module, integrated with own circulation, easy mounting and replacement possibility, controlling & monitoring, security & safety. FFG façade ensures comfort for the occupants with additional aesthetic outlook.

Aesthetical qualities of WFG:

- **Visually "normal" insulation glass units**
- **No visible flow of water**

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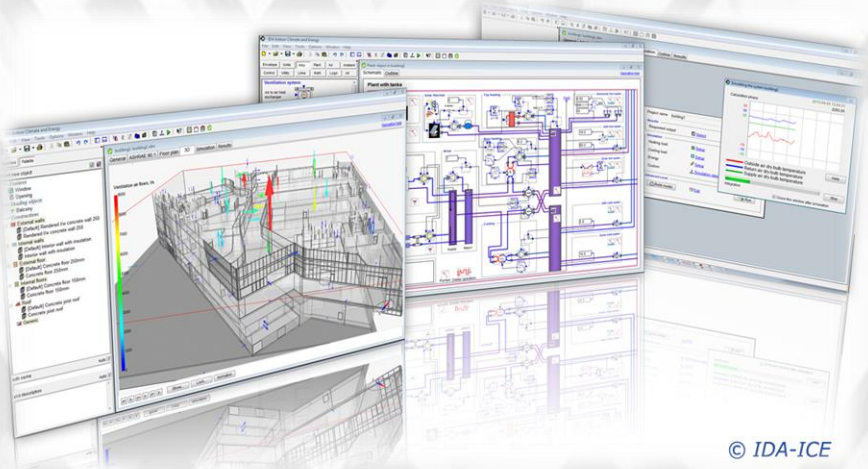
Due to aesthetic design trends and nZEB requirements, FFG is expected to be part of the construction products that generate the largest flat glass demand segment: about 80% of European demand and over 50% of U.S. demand.

Simulation models of the active WFG

To predict the performance and behaviour of FFG, as well as to optimise the modular unit and its components mathematical and simulation models were developed. They include heat exchange, fluid flow dynamics, optical and structural behaviour, environmental influences. The models are validated through software codes, considering benchmark test cases, and real data provided by spectrophotometer measurements. The software is successfully integrated under the existing and widespread software product IDA-ICE. The main result from the simulation models give us values for important thermodynamic parameters of the FFG which help us to predict the thermal behavior of a building.

Development of an advanced software tool

FFG mathematical models are used for future simulations and energy strategies on building and district heating level. The FFG makes the thermal behavior of a façade highly dynamic. Depending on the energy strategy and the flow rate of the fluid, the thermal conductivity of the glazing can vary in a wide range. First generation simulations are carried out and an advanced software tool that calculates the dynamic thermal behavior of the FFG is developed. A whole year simulations of four rooms with façades facing south, west, north and east were made for the locations Madrid, Sofia and Frankfurt and a comparison with a conventional solar control glazing. The characteristics of the FFG were based on detailed simulations with IDA-ICE simulation environment using high accuracy. During the simulation tasks, not only the energy performance of the WFG System is studied but also comfort performance is analyzed.



The software tools for thermal calculation of façades work with static models leaving physical changes within the façade unconsidered. With the new extensions architects and building engineers will have the possibility to implement the fluid flow glazing system into their projects for thermal simulation of novel buildings.

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