Partners

UNIVERSITAET BAYREUTH (UBT)
University of Bayreuth, UBT, Germany, has an excellent reputation as a foremost academic institution with many prestigious awards. UBT is among the Top Ten of the Humboldt Foundation ranking list and in 2nd place in Germany as well as rank 40 worldwide in The Times Higher Education ranking list of 100 best "young" Universities (less than 50 years since foundation) (2013).

BOLLINGER+GROHMANN INGENGIEURE
Bollinger+Grohmann Ingenieure, Germany provides a complete range of structural design services for clients and projects worldwide. They have successfully been collaborating with numerous internationally recognized architects for years and strive to always provide the best solution through their creativity and technical excellence. The office contributes to InDeWaG with their longstanding experience in energy efficient building design, building structures, facade design, building performance and consulting for energy efficient and sustainable buildings.

ETEM BULGARIA AD (ETEM)
ETEM, Bulgaria, complements the industry participation in the project with their experience in designing façade systems which are cost effective, user friendly and ready for mass production. Their main contribution in the project will be the set up of technical requirements for the system solution and the design and production of the aluminum profiles for the facade system as well as active involvement in the business cases and market uptake.

HTCO GMBH (HTCO)
The SME HTCO, Germany, as a leading engineering company in the field of fluid flow and heat transfer simulation will be responsible for the development and optimization of the geometrical design and physical performance of the active solar multi-layered facades.

SAVIOR VENTURE CAPITAL (GMAE TRANSFORMA S.L.) (SVC)
The SME Savior Venture Capital - SVC, Spain, was founded in 2008 by an ex McKinsey engagement manager to strengthen companies' competencies in industrial processes and help disruptive technologies become business by devising sound business models.

TECHNICAL UNIVERSITY OF MADRID (UPM)
Technical University of Madrid (UPM). Spain, is a public university in Madrid area that comprises Engineering and Architecture Faculties. UPM Members hold patents related to Building Energy Management. They have developed devices and Systems to monitor and to reduce energy consumption in buildings.

CERVIGLAS S.L. (CG)
Cerviglas S.L., Spain, to complete the consortium, the SME Cerviglas will be responsible for the production and technical advice of glasses and prototypes for the InDeWaG facades. With more than 30 years' experience in the design and development of facade glass projects, the company plays a major role in the consortium, especially for technological advice and anticipating market demands.

FRAUNHOFER GESELLSCHAFT e.V. (FRAUNHOFER)
Fraunhofer Gesellschaft Ev, Germany, for testing and measuring the fluid glass facades, the large research organization Fraunhofer will provide their cutting-edge test facilities, e.g. to investigate transmittance, reflectance, energy performance, accelerated as well as outdoor exposure tests to assess the reliability of the proposed materials and of demonstrators.

ARCHITECTONIKA (ARCH)
Architectonika, Bulgaria. The architectural bureau and SME Architectonika with its focus on energy efficient building solutions contributes to the project with architectural design aspects and applications, the impact on architectural aesthetic and forms as well as daylight/artificial light aspects.

CENTRAL LABORATORY FOR SOLAR ENERGY AND NEW ENERGY SOURCES (CL SENES)
The Central Laboratory of Solar Energy and New Energy Sources (CL SENES), Bulgaria, as a research institution in Bulgaria is focused in doing primarily fundamental and applied research in the field of renewable energy sources and in particular solar energy.

InDeWaG

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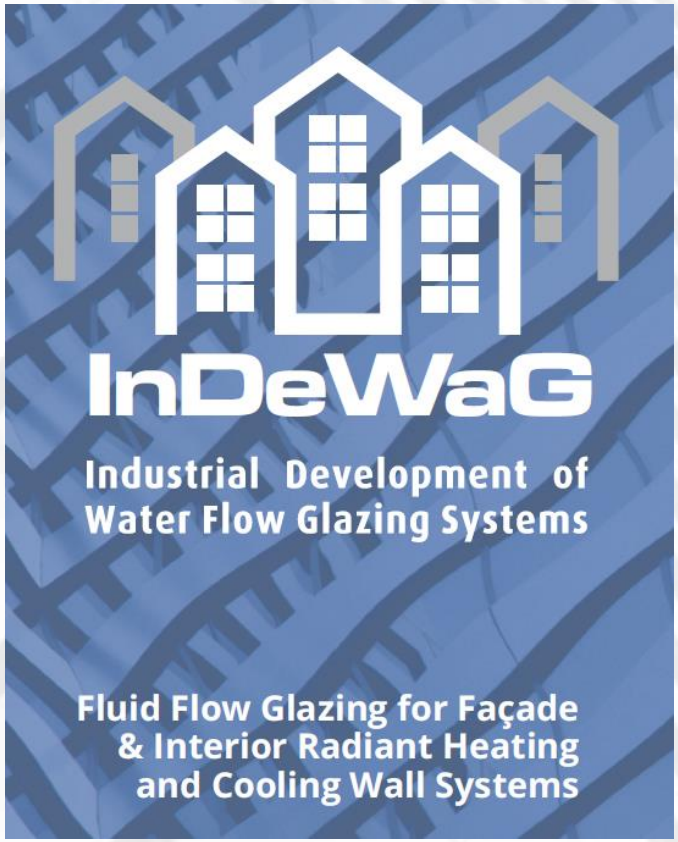
European Commission
Horizon 2020
European Union funding
for Research & Innovation

Buildings design for new highly energy performing buildings



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 fluid flow glazing (FFG),** which harvests solar energy for various use at large scale.

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Progress

Innovative façade Technology for nZEB

Innovation

What is InDeWaG?

InDeWaG (Industrial Development of Water Flow Glazing Systems) aims to technical innovation, introducing a new building envelope system which has at least 15% building cost reduction potential and could be brought to industrial ripeness. The cost reduction goal and nZEB performance will be achieved with Fluid Flow Glazing (FFG) modular facades and PV-installations, which minimize the energy costs for heating, ventilation and air conditioning (HVAC).

What is Fluid Flow Glazing?

The modular elements FFG give maximum daylight utilization and maximum interior comfort and are working as transparent low temperature solar collectors. FFG is a module with a vertical shape with dimensions 1.3m x 3m. It consists of a triple glazing with two chambers (a fluid chamber and a chamber with argon), a modular aluminum frame that encloses the glazing, a pump and a heat exchanger. Each module includes its own pump and heat exchanger making the separate FFG elements independent of each other. Circulating pump provides flow rates of up to 8 l/min per window.

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.

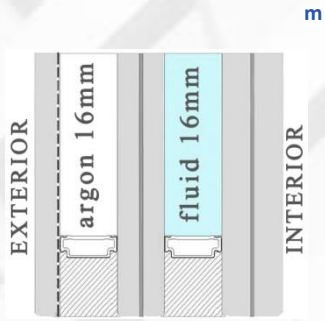
Advantages of FFG compared to other facade solutions:

- The modular panels of FFG help to achieve nZEB requirements;
- Efficient heat transfer;
- Façade providing heating and cooling;
- Great visual and thermal comfort;
- Reduced need for shading;
- Easy mounting and replacement possibilities.

Software

To predict the performance and behavior of FFG, as well as to optimize the modular unit and its components mathematical and simulation models were developed. These models cover all relevant physical processes - heat exchange, fluid flow dynamics, optical and structural behavior as well as environmental influences, and are based on thorough research and modern computer simulation methods (CFD, FEM)

One of the major objectives of InDeWaG is to expand the state of the art building simulation software with additional modules that can calculate the dynamic thermal behavior of the FFG. The software is successfully integrated under the existing and widespread software product IDA-ICE. With this extension architects and building engineers will have the possibility to implement the FFG system into their projects for thermal simulation of novel buildings. Those models describe the change of the thermal conductivity of the glazing due to varying fluid flow rate (g- and U-values) as well as the energy gain in the FFG and are implemented in IDA ICE for calculating different energy management strategies at building level.



Glass composition of the façade

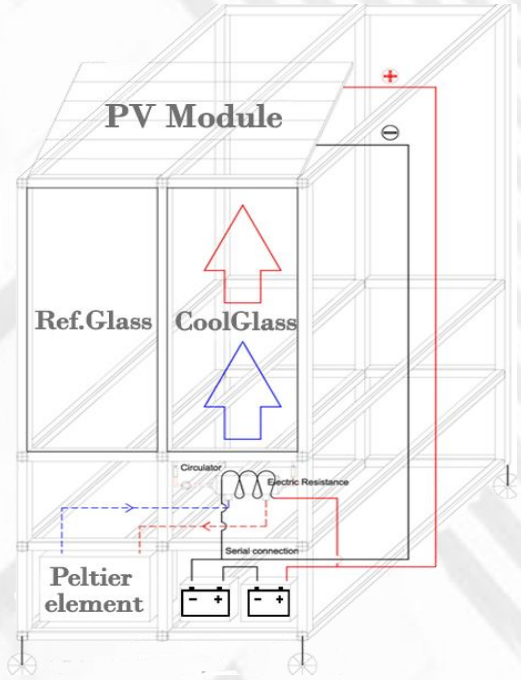
Schema of FFG module

Demonstrational Mock up - Madrid

Energy strategies as well as construction and production processes will be validated through extensive testing and monitoring of demonstrators (in Spain and Bulgaria) under real conditions in different climates. The starting point of monitoring and controlling system is the Spanish demonstrator, used to validate the whole concept.

The mock up is an autonomous mobile prototype with dimensions 1.5 m x 1 m. The total dimensions of the mock up are 1.85 m height and 1.26 m width.

Three of its facades, the floor and the roof are formed by opaque enclosures made of sandwich panel. The main façade is composed of two glazing's: Reference glazing (1x0.5m) and CoolGlass (1x0.5m), connected to its corresponding circulator. The unitized module has PV panels on the roof that power the water circulation pump. The main strategy of this mock up is to reject solar energy by means of the CoolGlass module and achieve high levels of comfort in the interior of the cabin, for cooling and for heating.



Autonomous - mobile mock up. General scheme

The main objectives of this demonstrator are:

- Evaluate differences between isolated glazing and glazing integrated in an insulated room;
- Validation by means of real data of mathematical models for internal solar distribution;
- Measurements for energy demand during the whole year;
- Comparison of thermal performances between the Reference Glazing and CoolGlass Module;
- Validation of nearly zero energy strategy based on a Peltier Cooler device and electric resistance powered by photovoltaic panels;
- Overheating evaluation of different surface finishes: White box and black box.