



-  THERMAL COMFORT
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Third Newsletter **OCTOBER 2016**

ADAPTIWALL UPDATE

ADAPTIWALL provides a new façade panel for energy-efficient retrofitting of buildings reducing the energy consumption by more than 50% in comparison with conventional retrofitting. The basic idea of the ADAPTIWALL concept is to meet the demand for indoor cooling or heating by allowing adaptive energy exchange with the outdoor climate. This novel panel integrates:

HARVEST: System of glass cladding and insulation, which is by-passed to collect energy in the buffer and release it when needed for heating or cooling. This by-pass is sensor-controlled and adopts itself to indoor-outdoor climatic differences.

STORE: Lightweight concrete with additives for maximized heat exchange and heat storage capacity (3x higher than normal concrete).

BREATHE: Compact ventilation and energy recovery system (THEX) which eliminates auxiliary HVAC installations and improves indoor air quality through an innovative membrane and separator combination.

RECAP OF WORK DONE

In the first two years, the work focused on material development, energy performance simulations and lab-scale performance testing of the separate components, resulting in the final selection of the materials & concepts to be used for the three components. In the third year the developed components were integrated in 1 m² lab-scale prototypes to test the thermal behavior of the ADAPTIWALL concept. Based on the results a real scale demonstrator is now designed.

TEST RESULTS OF ADAPTIVALL LABSCALE PROTOTYPES

Four lab-scale prototypes were built in Spain, at the Algete Demo Park of ACCIONA, for experimental assessment of the thermal behavior of the adaptive insulation-buffer combination (see Figure 1). The THEX was tested separately in France at CEA.



Figure 1: On the left: lab-scale prototypes of ADAPTIVALL, on the right: prototype of membrane separator.

The adaptive insulation-buffer concept consists of a type of solar collector, bypassing a static insulation component for energy storage in the concrete buffer and a type of radiator for exchange with the indoor environment. Results of the testing of the adaptive insulation concept show the “proof of concept”: energy is transmitted from the outside facade to the buffer of the ADAPTIVALL, temporarily stored and transferred to the indoor. The amount of energy that can be transferred is similar as what came out of the one room simulations, which predicted overall energy savings of at least 50% compared to traditional retrofitting ($R_c = 5 \text{ m}^2\text{K/W}$).

Based on a concept patented in 2012 by CEA and developed further in Adaptiwall, prototypes of a membrane separator for the THEX have been manufactured and characterized. A dedicated mockup and an experimental loop were set up for this.

In a counter flow configuration, the THEX appliance consists of a stacking of a moisture selective membrane and separator. The separator is optimized to enhance thermal transfer, preserve mass transfer area and assure a perfect supporting of membrane. The prototypes were built in polymer by 3D additive method.

Tests of membrane characterization showed a good improvement of global transfer and recovery efficiencies in comparison with state of the art technology. The open honeycomb web separator with a pitch of 20 and 30mm gave the higher efficiencies. An increase of energy performance between 10% and 15% can be expected with the new technology comparing to the state of the art HVAC and THEX technology.

Demonstration activities

Based on the test result of the 1 m² lab-scale prototypes, the Adaptiwall concept is now optimized and designed for 2 real-size (approximately 10 m²) demonstrator panels including the THEX. Designed total thickness of ADAPTIVALL panel is 35cm.

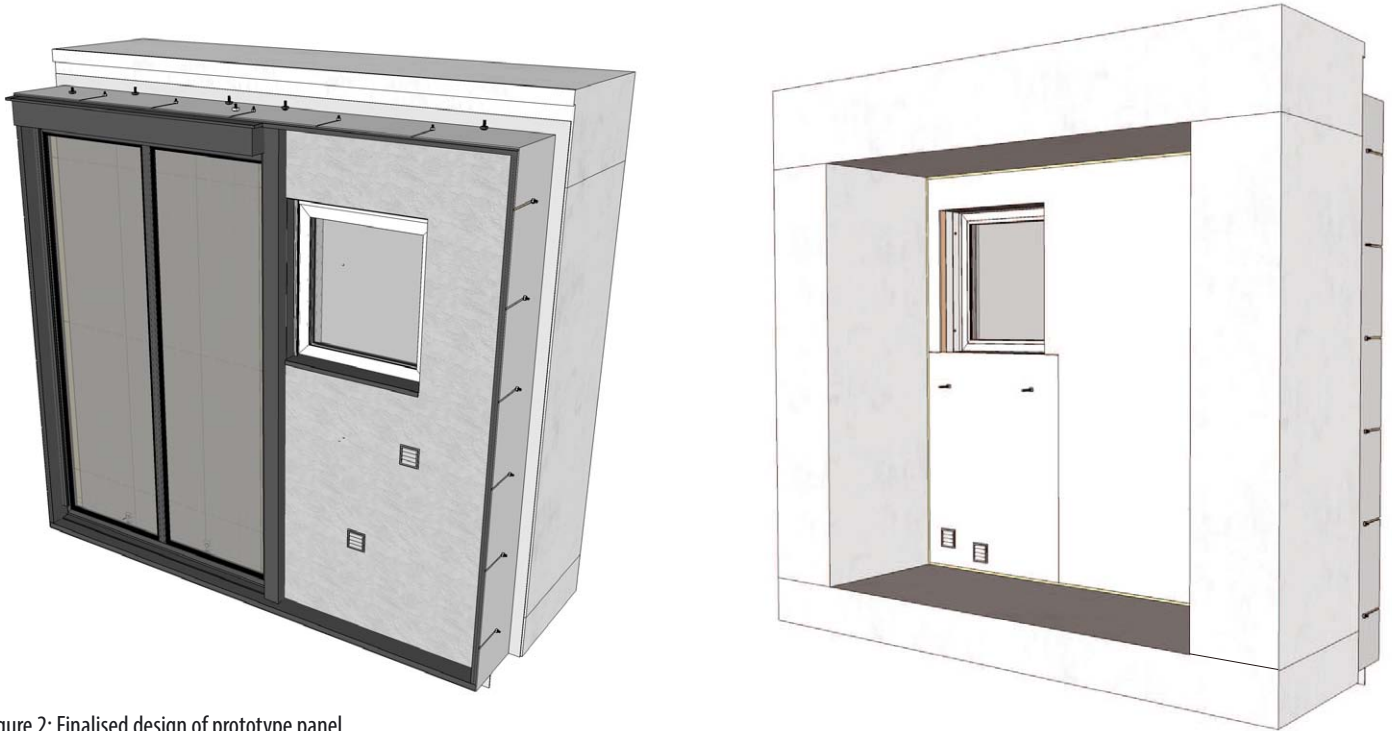


Figure 2: Finalised design of prototype panel.

The next step is the manufacturing and testing of these demonstration panels on the PASSYS cell test facility of CEA at Bourget du Lac (France), see Figure 3. The panels will be fully instrumented such that different scenarios (for example different user behavior) and control strategies can be tested. Main objective of this demonstration is to characterize the dynamic behavior of the façade and thereby to verify the energy saving objectives of Adaptiwall.



Figure3: INCAS experimental platform of CEA INES, at the middle two PASSYS test cells, at the back INCAS experimental houses

ADAPTIWALL at BAU 201

January 16th – 21th, 2017

The ADAPTIWALL project will be present on the World's Leading Trade Fair for Architecture, Materials and Systems – BAU 2017, to show the great advantages of this innovative system to the public. The fair will take place in Munich in Germany between 16th and 21th of January 2017.

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www.adaptiwall.eu

PROJECT PARTNERS

