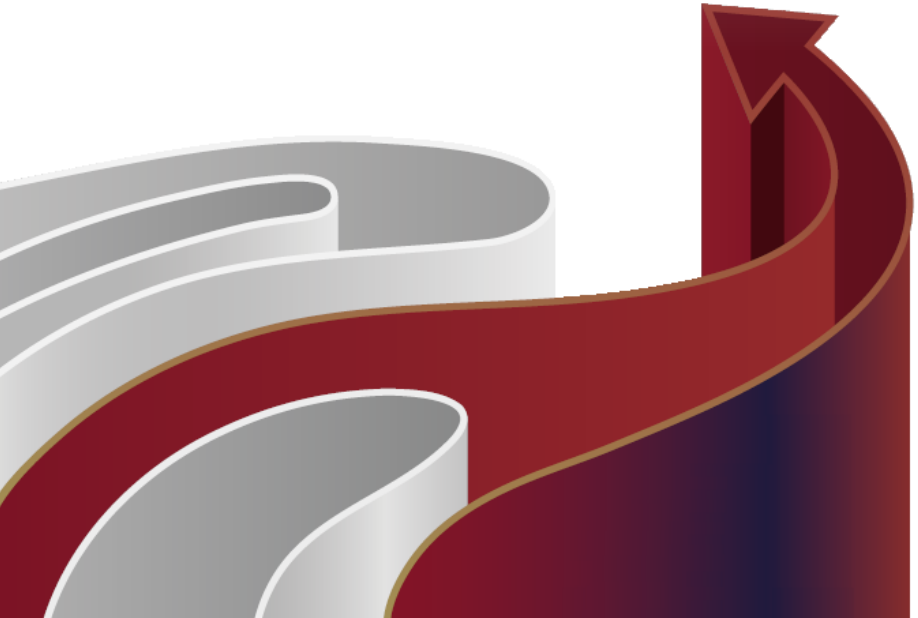
Energy Efficient Ventilated Façades for Optimal Adaptability and Heat Exchange enabling low energy architectural concepts for the refurbishment of existing buildings.

E2VENT project presentation



Event name

Presenter name, company

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E2VENT Project

42
Months

13 Partners

8 Work
packages

3,4 Million
budget

- E2VENT is 42 months research project funded by European Commission under the **Energy Theme of the Horizon 2020** for research and Technological development.
- Focus on developing an energy efficient ventilated façade system for the refurbishment of existing **residential multi-storey building**s, i.e. a modular adaptable system embedding heat exchange and heat storage units to reach optimum energy performance.

Introduction

- **Old buildings** (vast majority of the building stock) are predominantly of low energy performance and subsequently in need of refurbishment work.

- Within the existing European building stock approximately **34% of the multi-storey residential building** stock is built in the **60's 70's** → only few or no requirements for energy efficiency, characterized by:

high energy losses through the envelope and high energy consumption

low indoor air quality and humidity that can lead to a deterioration of the health of the end user

poor aesthetics, and a need for maintenance

Introduction

- E2VENT develops, demonstrate and validate a cost effective, high energy efficient, low CO_2 emissions, replicable, low intrusive, systemic approach for retrofitting of residential buildings, able to achieve remarkable energy savings, through the integration of an innovative adaptive ventilated façade system, including:

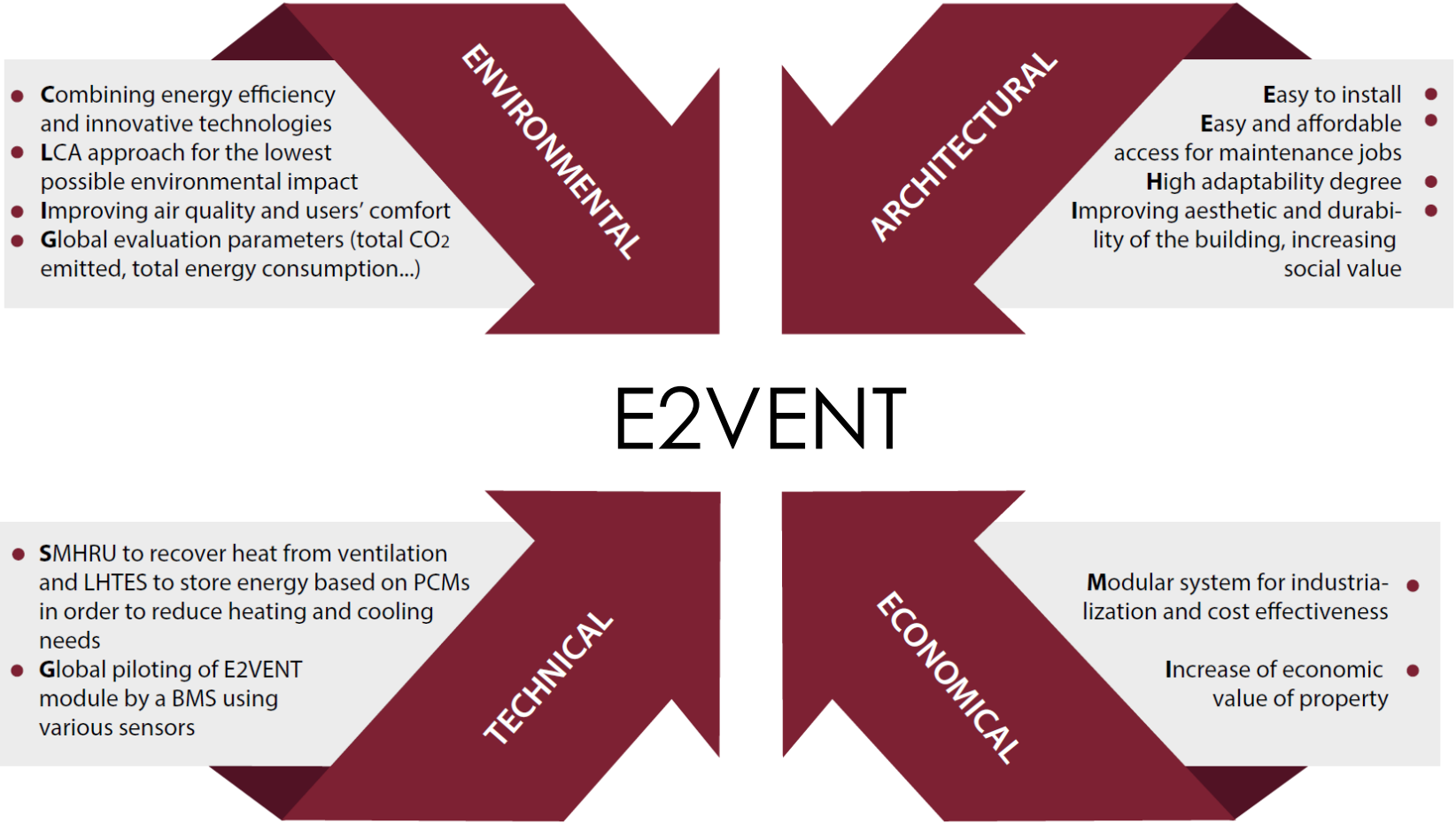
Smart modular heat recovery unit which improves Indoor Air Quality while minimizing energy losses

A latent system using PCM that allows thermal storage mode for the reduction of energy peaks

Cost-effective, easy to install, high performance adapted products for external thermal insulation

A smart building management system enhancing the user experience and allowing future adaptability

Objectives


ENVIRONMENTAL
Combining energy efficiency and innovative technologies
LCA approach for the lowest possible environmental impact
Improving air quality and users' comfort
Global evaluation parameters (total CO_2 emitted, total energy consumption...)
ARCHITECTURAL
Easy to install
Easy and affordable access for maintenance jobs
High adaptability degree
Improving aesthetic and durability of the building, increasing social value
E2VENT
TECHNICAL
SMHRU to recover heat from ventilation and LHTES to store energy based on PCMs in order to reduce heating and cooling needs
Global piloting of E2VENT module by a BMS using various sensors
ECONOMICAL
Modular system for industrialization and cost effectiveness
Increase of economic value of property

Concept

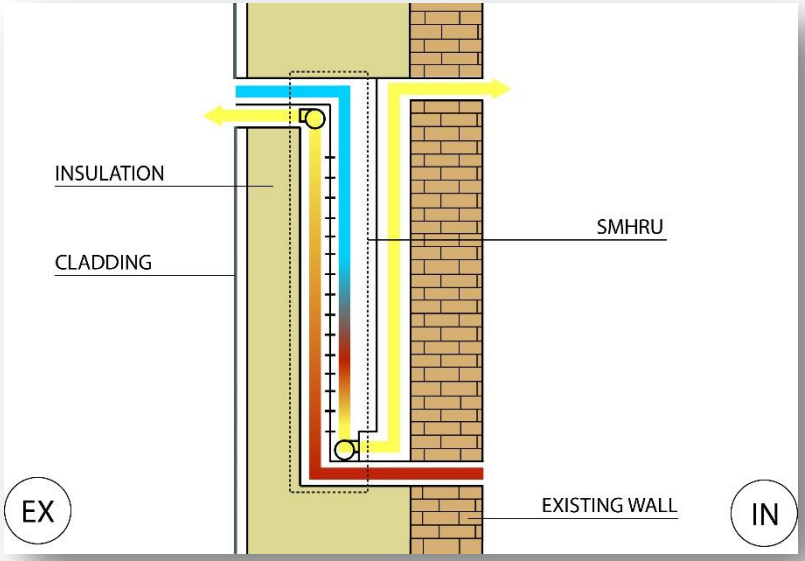
The E2VENT system is an external refurbishment solution with external cladding and air cavity that embeds different breakthrough technologies ensure its high efficiency:

- **A Smart Modular Heat Recovery Unit** (SMHRU) for the air renewal allows the heat recovery from the extracted air using a double flux exchanger. Indoor Air Quality is ensured while limiting the energy losses.

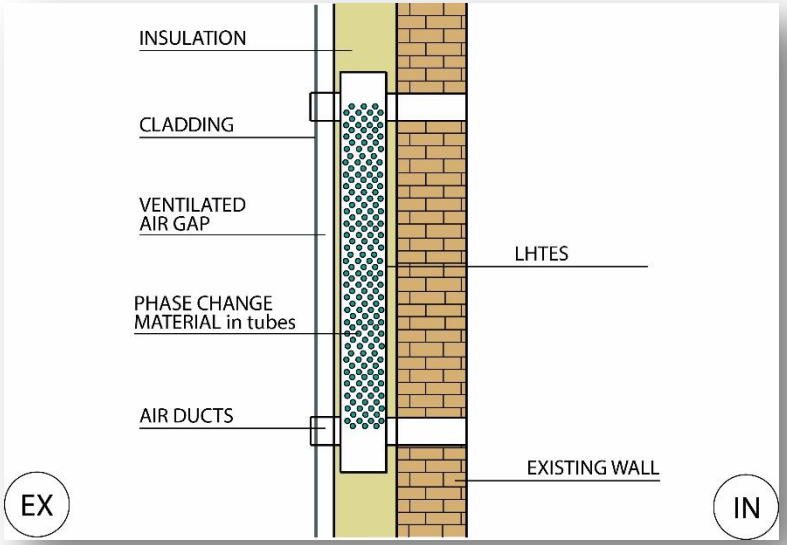
- **A Latent Heat Thermal Energy Storage** (LHTES) based on phase change materials will provide a heat storage system for heating and cooling peak saving.

E2VENT system on the wall

Concept



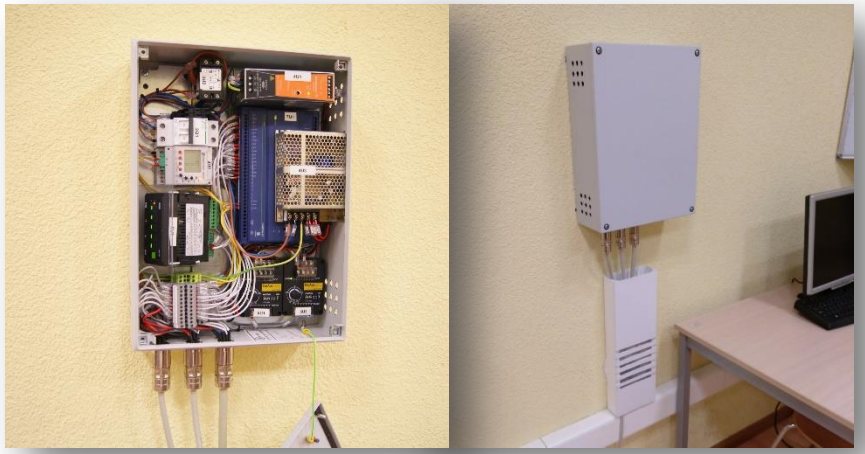
SMHRU Smart Modular Heat Recovery Unit



LHTES Latent Heat Thermal Energy Storage

Concept

- **A building management system** that controls the system on a real time basis targeting optimal performances. It will embed new sensors, communicate with existing systems and recover predicted weather.



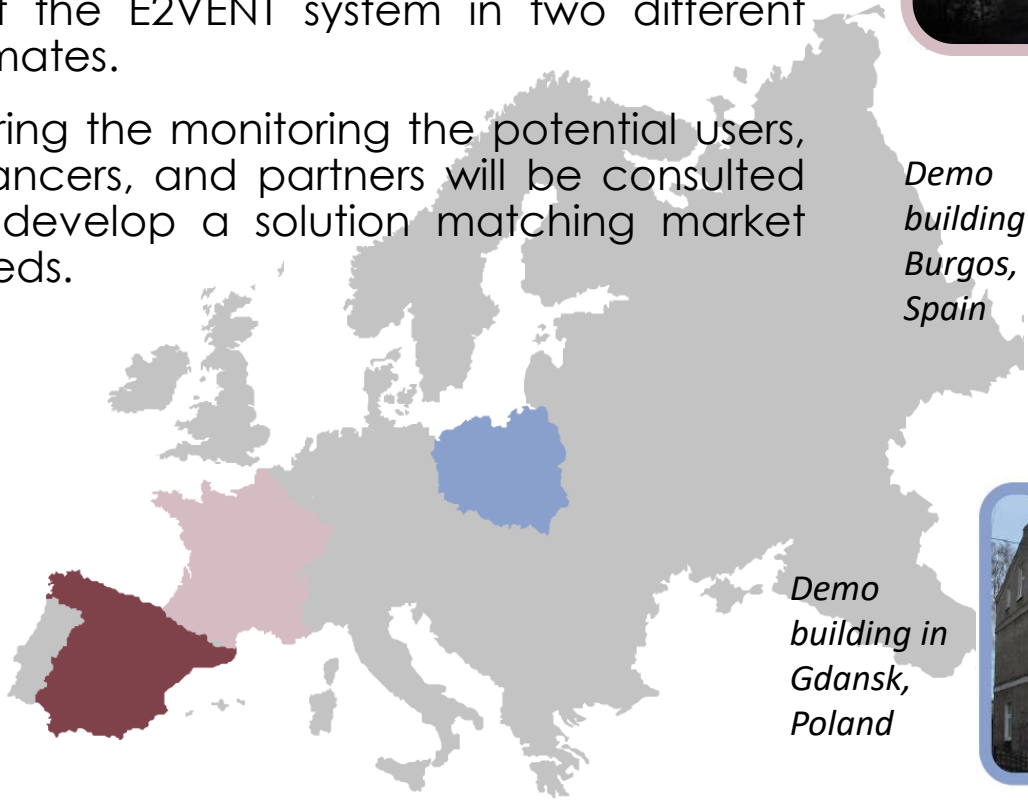
- **An efficient anchoring system** that limits thermal bridges and allows an easy and durable installation.

Demonstration

- Prototypes performance firstly tested on the future façade test bench of **Nobatek**.
- Two pilot buildings renovated with E2VENT systems (Poland and Spain) in order to test the E2VENT system in two different climates.
- During the monitoring the potential users, financers, and partners will be consulted to develop a solution matching market needs.

Façade test bench of Nobatek in Anglet, France

Demo building in Burgos, Spain



Demo building in Gdansk, Poland

Prototyping

- **SMHRU** is novel as it is a very thin double flux exchanger that can be integrated in a renovation module. The theoretical efficiency that has been calculated is over 90%, although we expect that the measured one will be lower (around 80%) due to practical reasons. **An efficient anchoring system** limits thermal bridges and allows an easy and durable installation.

Installation of SMHRU

Anchoring system

Anchoring + beams

Prototyping

- **LHTES** includes custom-made tubes made in aluminum in order to ensure the PCM encapsulation. This encapsulation allows a better heat exchange between the air and the PCM as the surface is large and the conductivity very high, and thus a higher efficiency for the overall system.

Manufacturing of LHTES

LHTES prototype

Test Bench in Anglet

- The test bench allows installing the systems on a **2,6m high and 2,7m width** wall associated to a cell that is fully equipped with HVAC systems and measurements, allowing to assess the energy performance of those systems on the associated zone. Another cell with an identical wall has been renovated with an ETICS and serves as a business reference. The performance of the two renovations will be compared.

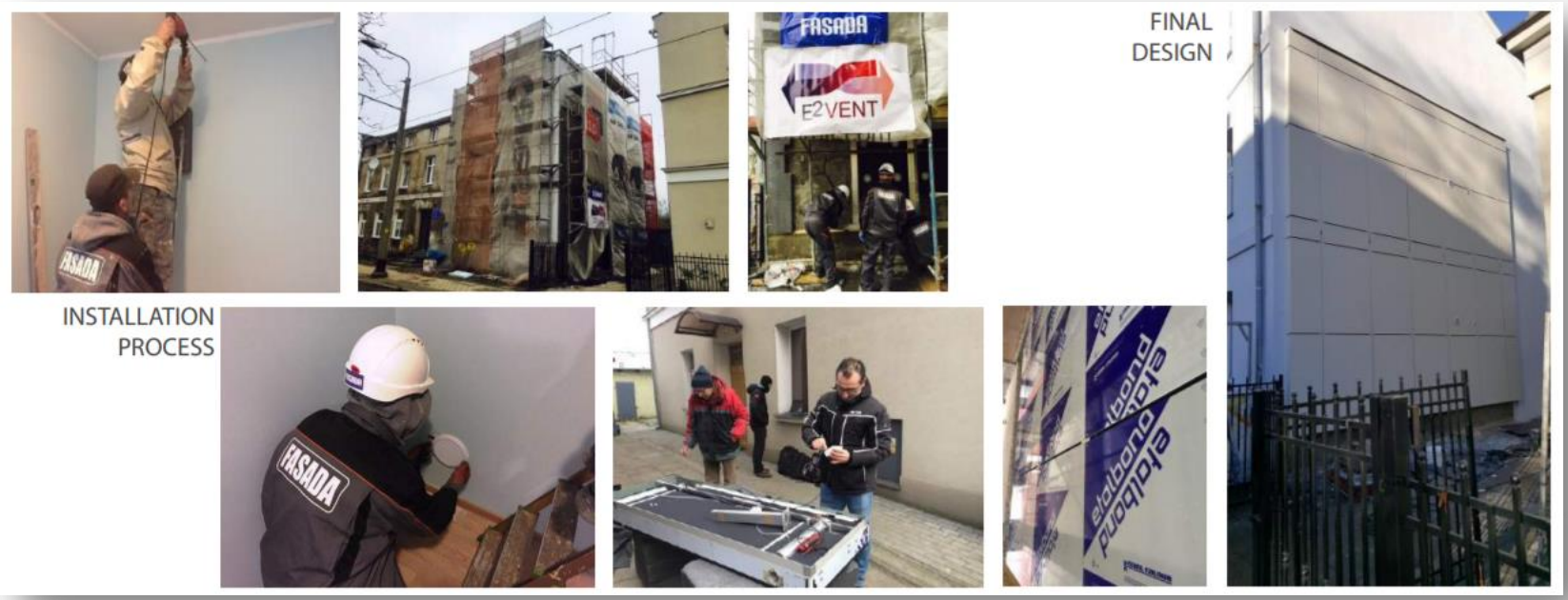
01 The start of the installation on the BEF wall 02 SMHRU during the assembling 03 SMHRU on the BEF cell 04 Installation of the LHTES on the BEF cell 05 Global view of the LHTES and SMHRU on the BEF wall.

Demosite in Burgos

- The building is in the **University of Burgos**, partner of the project. It is composed of two rooms (computer lab and classroom) with high internal heat loads which imply a need of air renewal and cooling. The renovation design corresponds to the installation of **3 SMHRU** units and **2 LHTES** units for a total ventilated façade to be installed of **250 m²**.

Demosite in Gdansk

- E2VENT solutions were demonstrated on two flats. The elements composing the design were **two SMHRU** allowing air renewal to ensure better indoor air quality while limiting thermal losses thanks to the double flux heat exchanger, **two BEM** systems, that allow the smart piloting of the HVAC, the **ventilated façade (40 m²)** of Etalbond panels, fixed on vertical T-profiles on VARIO brackets, and **ETICS façade (120 m²).**



Partners

Nobatek

Project Coordinator, Test Bench

acciona

Demonstration, monitoring & validation

ECCO EUROPEAN ALUMINIUM

Relation between research project and aluminium industry

FASADA

Functional design, construction of Gdansk demo site

RINA

Exploitation & market strategy manager

tecnalia Inspiring Business

Leader of the elements development

[TECHNOLOGY CENTRE] CARTIF

Eco-design & architectural Integration manager

UNIVERSITY OF Hull

Thermal modelling of the heat exchanger

FENIX.TNT tvořivost nad technologií

Dissemination manager

ARISTOTLE UNIVERSITY OF THESSALONIKI

Requirements & Specifications manager

ELVAL COLOUR

Testing, Demonstration, monitoring & Validation

UNIVERSIDAD DE BURGOS

Burgos demo site & building materials

picharchitects

Architectural integration & aesthetics consideration

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www.e2vent.eu

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