

2018

EeB PPP Promising Technologies

Advanced materials solutions



ENERGY EFFICIENT BUILDINGS

AN ECTP COMMITTEE FOR INNOVATIVE BUILT ENVIRONMENT



External insulated façade with VIP

Super insulation thin ventilated façade using VIPs for retrofitting



Vacuum Insulation Panel (VIP) 3cm thick and 110x700 mm, its placing and UPV/EHU building demo site after Super insulated façade installation

The project A2PBEER introduces the application of the high insulation performance provided by the vacuum insulation panels (VIP) as a solution to develop thin ventilated façades for retrofitting.

The developed ventilated façade system uses only 3 cm thick VIPs, and including the new anchoring system, including also the exterior it has been achieved a thermal transmittance (U-value) of 0.276 W/m²K. The total finished ventilated façade, including VIP, anchoring, air chamber and the covering is the 10 cm thickness only. It provides a wide range of applications in retrofitting when low thickness is available but high insulation performance is required.

The placing system is based on a specific anchoring development that assures some overlapping of the consecutive VIPs to have the high thermal and hydrothermal isolation performance.

As VIPs cannot be cut on site, they have been rationally designed into 10 types of pre-dimensioned VIPs to cover almost all the scenarios that can be found on the different façades to be retrofitted.

The façade consists in the integration of the 3 following components:

- Super insulation panels VIP systems with thickness of only 3 cm for transmittance of 0.16 W/m²K.
- Flexible design of panels with only 10 predefined dimensions for near all the scenarios,
- Fixing system using joints to facilitate overlapping of VIPs.

The target market is the retrofitting insulation for ventilated façades solution in very general vision, but there are some sensitive markets that are demanding this type of solutions, such as:

- Urban centres for relatively low impact and dry retrofitting.
- Retrofitting in wet areas with buildings affected by wind-driven rain.
- Historical and singular buildings retrofitting and repairing when compatible with ventilated façades

Super insulation VIPs are designed by ISOLEIKA that also fabricates the 10 pre-dimensioned in 3 cm thickness, with the more widely applicable format of 1100 x 700 cm. Anchoring was developed and exploited by BERGAMO TECHNOLOGIES.

Another solution exploited by ISOLEIKA is also available and developed within the A2PBEER project consisting in an insulation solution for internal retrofitting. In this case, it is used in combination with drywall also 10 cm solution and with high thermal performance.

- **Reduces the thickness of the ventilated façade to only 10 cm**

- **The full system shows an insulation transmittance (U-value) of 0.276 W/m²K**

- **Application of very thin (3cm) VIP rationally pre-dimensioned.**

- **Hydrothermally inert.**

- **Compatible with any covering material**

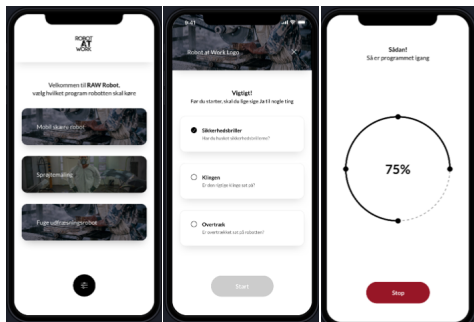
- Technical completion: between 1 and 2 years
- Can be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

Project: A2PBEER, Affordable and adaptable public buildings through energy efficient retrofitting, www.a2pbeer.eu

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Invela robot at work

New scalable modular robot with platform for on-site construction work



Today, the construction industry lack up to 40% of the labour needed in the renovation and the new buildings demand in Europe towards 2040. With manual and labour-intensive work processes, the construction industry desperately needs solution able to optimize and automate. Currently, implementation of robots in the construction sector is approximately 0,2%.

Robot At Work has developed a state-of-the-art modular robot platform for the construction industry that can work from 1m2 to 60m2 on-site and has a multifunctional use, which means it can be integrated in many different kinds of task. The robot platform can operate with different kinds of tools: e.g. spray-painting, spraying mortar for rendering, milling, 3D printing on ground or facade with any material, moving or lifting materials, cutting of different types of plates. The flexibility of the robot platform makes possible to make easy onsite reconfiguration, which gives the entrepreneur and/or craftsmen the opportunity to use the robot to perform different tasks and processes on the construction site.

The modular robot is controlled by an intuitive tablet/smartphone-based interface allowing the construction worker to setup the robot and start, pause, and stop a preprogramed work package.

For the first time ever, this solution allows for an on-site robot to execute exactly what has been drawn and planned by the architect in cooperation with the craftsman, ensuring better workflows, quality, and minimizing inaccuracies.

The modular robot will be able to save labour time on-site from 10% up to 80% depending on the tasks and processes performed

Robot at Work aims at a rapid and scalable market introduction with essential strategic partners within different technical sectors of the construction industry. The goal is to make different strategic partners and end-customers able to easily apply the modular robot to whatever task or process they want to automate.

- Technical completion: less than 1 year
- Can be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

Project: P2ENDURE, www.robotatwork.com

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ISOCAL - Insulation lime mortar for restoration

Insulation hydraulic lime mortar using aerogels for historical buildings



Application and monitoring of the Lime Mortar

ISOCAL is a hydraulic lime mortar developed for use on masonry cultural heritage buildings and retrofitting districts.

The insulation mortar render cover the market needs of the building stock retrofitting and rehabilitation from before 1900 that was erected with natural hydraulic lime-based mortars in solid masonry.

The applied render thickness of 3 cm provided the recommended insulated, mechanical and hydrodynamic performance.

During the project EFFESUS the ISOCAL render was applied and evaluated in the historical building of "Alte Schäfllerei" in Fraunhofer (Germany), dated from around 1760.

The lightweight hydraulic lime mortar was prepared with conventional and advanced additions to assure a very improved insulation performance, providing thermal conductivity of 1.16W/m2K at 3 cm thickness.

The mortar render can be apply of indoor and outdoor for insulation in many kind of mineral surfaces, such as natural stone, brick, ceramic, block, old intact mineral render/plaster and concrete. It can be applied following the standard application by hand or sprayed. As it is not a finishing product, it should be covered with a compatible finishing product.

- **Hydraulic lime mortar for insulation on historical buildings application.**
- **Isolation capacity of ISOCAL is 1.16W/m2K (2 times better than lime mortar conventional).**
- **Easy to apply solution for insulation restoration and rehabilitation of historical building, particularly for apartment building at competitive cost.**
- **Appropriate for indoor and outdoor applications**
- Technical completion: less than 1 year
- Can be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

Project: EFFESUS, www.fffesus.eu

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SUSCON geopolymer concrete

Geopolymer concrete with pfa-based binder and mixed plastic waste aggregates for block or panels



Due to the growing and challenging target of a sustainable building sector, an evolution of EU and national regulations and technical specifications on secondary materials and their potential integration in construction products has been developed in recent years.

The SUS-CON project has developed alternative concrete solution using waste materials in the production cycle of light weight concrete products such as masonry blocks and precast panels. Different materials were developed using plastic waste, tyre rubber or polyurethane foam as aggregates and Pulverised Fuel Ash (PFA) &/or Ground Granulated blast furnace slag (GGBFS) as binder. The formulations developed in the project have a competitive compression strength and thermal conductivity compare to traditional light weight concrete.

The precast elements with that technology have a comparative strength to existing solution with lower embodied energy and a better thermal insulation. The masonry concrete can achieve up to 18.2 MPa of compressive strength with a thermal conductivity of 0.266 W/m.K using waste plastic aggregates. The technology can be produced using either masonry plants or precast wall factories with no extra investment.

In general terms, the technology offers an alternative to traditional light weight concrete using pozzolan aggregates and Portland cement using only waste materials. By that mean the product can enter traditional construction market with the main advantage to offer a solution with a lower CO2 impact and a circular economy solution. The concrete formulation can be adapted to the final product specification in order to meet local market needs.

- **Recycled waste**
- **50 % less CO2 impact**
- **Equivalent mechanical strenght**
- **Fire resistance**
- **Better Thermal performance**
- **Equivalent acoustic performance**

- Technical completion: less than 1 year
- Can be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

Project: SUSCON, www.sus-con.eu

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This technology brochure highlights the highly promising innovations from selected co-funded European projects under the 7th Framework Program (FP7) and the 8th Framework Program (H2020).

The Energy-Efficient Buildings (EeB) Public Private Partnership (PPP) is a joint initiative of the European Commission (EC) and the Energy Efficient Buildings Committee of the European Construction Technology Platform (ECTP).

This initiative aims at promoting research on new methods and technologies to reduce the energy footprint and CO₂ emissions related to new and retrofitted buildings across Europe.

