

The contribution of Vacuum Insulation Panels to the achievement of the EU energy efficiency targets



About Vacuum Insulation Panels

Vacuum Insulation Panels (VIPs) are ultra-thin, super insulating products used in buildings, appliances and transport.

A VIP consists of a rigid, highly-porous core material encased in a thin, gas-tight outer envelope, which is evacuated and sealed to prevent outside gases from entering the panel. Compared to traditional insulation materials, VIPs have **top class insulation performances**: VIPs have a thermal conductivity between 0.002 and 0.008 W/(m·K) after production, 5 to 10 times better than other insulation materials¹.

VIPs have extremely **low insulation thicknesses** (10 mm to 25 mm), up to 90% less compared to traditional insulation materials with similar thermal resistance. VIPs considerably increase the volume capacity of applications for which a lack of space for insulation thickness is an issue.

Retrofitting buildings with VIPs ensure the maximisation of the living floor space, an issue of growing importance in our modern, crowded cities. VIPs offer new design and construction possibilities to architects, who can retrofit or build new houses and offices without the boundaries of space availability. Case studies showing the different applications of VIPs are available in the annex or on the website of VIPA International: <http://vipa-international.com/>.

¹ Thomas Haavi, Bjørn Petter Jelle Arild Gustavsen, Steinar Grynning, Sivert Uvsløkk, Ruben Baetens and Roland Caps, *Vacuum Insulation Panels in Wood Frame Wall Constructions - Hot Box Measurements and Numerical Simulations*, Journal of Building Physics August 2, 2012.

Applications

Buildings



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VIPs are used to retrofit thermal barriers in older buildings, increasing energy efficiency where it might otherwise be impractical to accommodate thick layers of conventional insulation. For new constructions, VIPs can be “built in” from the start, allowing for sleek designs that offer both space and energy savings. VIP technology has already been used to insulate floors and doors as well as dormer windows and glazed facades.

Transport



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VIPs deliver an ecologically friendly container solution, since they are reusable, recyclable and nontoxic. The highest echelon of this technology manifests itself in the transport of human organs and pharmaceuticals at tightly controlled temperatures, where a completely reliable, unbroken cold chain is needed. VIPs can also be used in walk-in freezers, grocery-store cold display cases, refrigerated shipping containers and cold vending machines.

Appliances



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Appliances are a traditional field of application for VIPs. As a result of continued R&D on core materials and envelopes, VIP technology has contributed extraordinarily to the increased efficiency of household and commercial appliances. Through the use of VIPs, household and commercial fridges qualify for superior energy ratings effectively and economically.

Sustainability & Recyclability

The most common core materials used for VIPs are fumed silica and glass fibres, while most manufacturers use aluminium-metallised high barrier plastic laminates, aluminium composite films and stainless steel films or sheets to provide the VIP envelopes. **The materials used for VIPs are easily available** and do not present any specific supply problem.

Failure risks are very low and **panels are very durable**. VIPs have to be installed properly and handled with care to avoid damages that could increase their thermal conductivity. However, even if the VIP is punctured, it may still have half the thermal conductivity of other insulation materials². They can be expected to maintain a low thermal conductivity for 25 years or more³. If properly separated from the structure, VIPs can also be reused.

² Par Johansson, *Vacuum Insulation Panels in Buildings - Literature review*, Report in Building Physics, Chalmers University of Technology, Göteborg, Sweden 2012.

³ Par Johansson, *Vacuum Insulation Panels in Buildings - Literature review*, Report in Building Physics, Chalmers University of Technology, Göteborg, Sweden 2012.

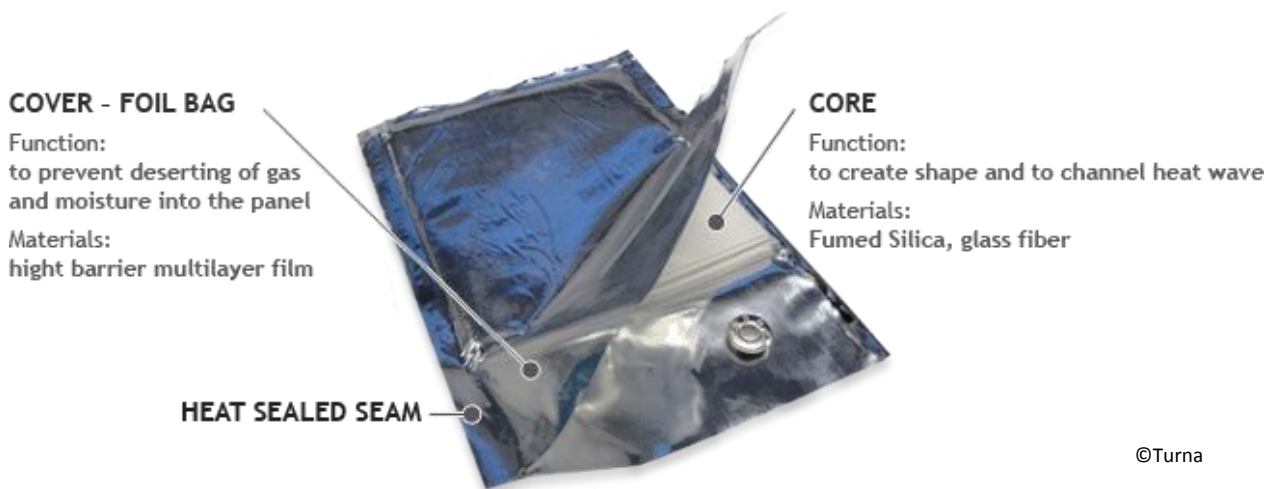
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VACUUM INSULATION PANEL

V I P A

GLOBAL ASSOCIATION

Being a relatively new product, for the moment there is no substantial experience in recycling VIPs installed in buildings. However, at the end of life, VIPs can be separated from the building structure and recycled. The core material used for the panel can be completely reused by the VIP industry. The fabric is added to thermal recycling while the metallised plastic composite film is directed to material recycling. The use of VIPs for higher fuel efficient transportation also contributes to an overall improved ecological footprint.



About VIPA International

VIPA International is the global association representing the interests of the VIPs industry, created in August 2014. The full membership is open to manufacturers of VIPs, suppliers of materials and equipment, while research institutes and universities can join as associate members. The association has now 14 full members and 4 associate members from Europe and China⁴. The members of VIPA International have seven VIPs production plants in Europe (Germany, Belgium, Slovenia, UK).

VIPA International is particularly active in the standardisation process: VIPA is liaison organisation at the European Committee for Standardisation (CEN) and contributes to the work of the CEN TC88 WG11 on vacuum insulation panels. VIPA International is also financing studies⁵ to fasten the standardisation process at European and international level.

⁴ Full list available here: <http://vipa-international.com/members>

⁵ “Compressive strength measurement of VIPs” – to be completed by summer 2016; “Develop an advanced technique for measuring the effect of moisture content on the thermal conductivity of VIPs”, to be completed by April 2017; “Calibration of the lift off technique for measuring the internal pressure of fumed silica VIPs and determination of boundary conditions for the lift-off measurements and processing of measurement raw data” – to be completed by March 2017.

VIPS and energy efficiency of buildings

Insulation offers an unrivalled opportunity to decrease CO₂ emissions, improve energy security and energy independence of Europe. Energy efficiency is the “first fuel for the EU economy”⁶ and better insulation of EU buildings must be the primary arena to achieve the EU energy efficiency target. In particular, deep renovation has the highest potential to deliver energy savings and must become the norm in the EU⁷.

Therefore, in the framework of the review process of the energy efficiency package, VIPA International recommends to adopt ambitious measures to improve the energy efficiency of EU buildings. VIPA International replied to the European Commission Consultation on the Review of Directive 2012/27/EU on Energy Efficiency (EED) and on the Evaluation of the Directive 2010/31/EU on Energy Performance of Buildings (EPBD). In our replies, we highlighted the shortcomings and possible improvements of both directives. Overall, delays in the implementation process, excessive flexibility and the general lack of enforcement measures and clear binding targets led to unsatisfactory results. Member states had too much flexibility to implement the directive and generally lacked ambition. Renovation and insulation requirements should be strengthened, while the connection with easier forms of financing should be improved, above all for super insulation technologies like VIPs.

Energy Efficiency targets

The general energy efficiency target of 27% by 2030 should be substantially increased: the European Parliament recommended a 40% target and we believe that only such ambitious target would allow Europe to respect the commitments agreed in Paris at COP21. Binding national energy efficiency targets and ambitious long-term strategy for mobilising investment in renovation should be established accordingly.

The building sector should be the first and most important sector for the EU energy efficiency target for 2030. The lifespan of buildings and their impact on the overall energy consumption should be reflected in clear and ambitious deep renovation and energy efficiency targets. Holistic, long term approach based on the energy efficiency first principle should be adopted. The EU must use best in class technologies, high energy efficient products and invest in deep renovation.

Renovation target

Binding national renovation targets are needed to achieve EU targets. In particular, we should **increase the renovation rate from the current 1% to about 3% every year.** Member States should lead by example with a 3% renovation target for publicly owned buildings, (Art. 5 of the EED), but lack of implementation and excessive flexibility are making it difficult to achieve this target.

⁶ Energy Efficiency Financial Institutions Group, *Energy Efficiency: the First Fuel for the EU Economy*, February 2015, http://bpie.eu/wp-content/uploads/2015/10/Final_Report_EEFIG_v_9.1_24022015_clean_FINAL_sent.pdf

⁷ Ecofys, *Deep renovation of buildings: An effective way to decrease Europe's energy import dependency*, 2014, <http://www.ecofys.com/files/files/ecofys-eurima-2014-deep-renovation-of-buildings.pdf>

Additionally, the 3% renovation target should be extended to all publicly owned buildings, also at local and regional level. Regional and local authorities have the highest potential to work as example thanks to their visibility for citizens and companies and should therefore comply with the same requirements of national bodies' buildings.

Public procurement and the role of public buildings

Deep renovation with a specific focus on insulation must therefore be the key target of EU energy efficiency requirements for public procurement.

To lead by example, **central governments must aim at purchasing only buildings with the highest energy efficiency performances**, not just settling down to the minimum energy efficiency requirements. Mandatory measures to use the best available technology and super insulation products should be promoted. The requirements of article 6 of the EED on public procurement should be extended to all public buildings.

Cost-optimal methodology

Cost-optimum methodology is surely a useful tool for comparability and renovation of buildings. However, it will be important to adopt ambitious targets to avoid that cost optimal levels will be used as an excuse to not go much further for development of nearly zero energy building targets.

Besides, **the methodology should take into account the cost of the useful floor area** that is needed to install a certain measure. The cost of the volume (e.g. internal living space) needed for the insulation should be included in the overall costs. When the cost of space and the energy efficiency gains resulting from their superior performances are considered, VIPs result less expensive than other common insulation products.

Energy Performance Certificates

The introduction of the EPC is a very important step towards renovation of the building stock and their use should be reinforced. The impact of EPCs on the building price has been observed in several countries and represents an important incentive to renovate buildings in Europe and improve their insulation⁸. Therefore, mandatory EPCs would represent a useful source of information for owners and tenants, but also for governments.

However, **EPCs should be improved and include space considerations**. Ideally, the data uploaded that lies behind the EPC should be more detailed and easily accessible, including existing construction build-ups that could then allow for more tailored alternative recommendations to be developed. This would allow going beyond current standards recommendations and paybacks. Rather than the EPC just being a requirement to be achieved, the certificate and report needs to

⁸ Buildings Performance Institute Europe (BPIE), *Energy Performance Certificates (EPC) across the EU*, 2014, http://bpie.eu/uploads/lib/document/attachment/81/BPIE_Energy_Performance_Certificates_EU_mapping_-_2014.pdf

clearly reflect actual and historic performance levels and give bespoke recommendations that are relevant and actually achievable, rather than generic information.

Besides, the EPCs are designed too differently across Europe and a real comparison is therefore not possible. Harmonisation is also extremely difficult to achieve.

Nearly Zero Energy Buildings (NZEBs)

The NZEB approach is surely a step in the right direction and it should be strongly supported at national and European level. **Aggressive definitions and ambitious sets of targets for nearly zero energy buildings are necessary to promote energy efficiency** across Europe. A clearer definition of NZEB agreed at EU level would surely guide member states in adopting coherent and ambitious policies⁹. However, without a clear definition and with the potential loophole of cost optimality, the EPBD target requiring all new buildings to be nearly zero-energy by the end of 2020 will be difficult to achieve, or if achieved might not deliver the expected benefits in terms of energy savings.

Financing

One of the key aspects for deep renovation of buildings is easy, secure and stable access to financing. Improvements to existing buildings often have a long payback period compared to their upfront cost.

This problem is particularly acute for super insulation technologies like VIPs, which can deliver more efficiency gains and higher returns but also have higher initial cost. This remains one of the areas where additional efforts are most needed to achieve the 2020 and 2030 targets. High performing technologies such as VIPs do not receive sufficient incentives and their potential to contribute to EU targets still remains untapped.

Therefore, VIPA recommends that the “Smart Finance for Smart Buildings” initiative announced in the Heating and Cooling strategy¹⁰ will address the needs of the insulation sector, providing better access to low interest finance to stimulate deep renovation and nearly-zero energy buildings. **Structural tax incentives, above all for high energy efficient technologies and deep renovation measures, should be adopted to achieve energy efficiency targets.** Better access to low interest (or zero interest) finance, structural tax incentives and regulation need to be blended to drive uptake. Finally, estimations of payback period (PBP) should include the value of the floor space made available by the thinness of the VIPs.

⁹ Buildings Performance Institute Europe (BPIE), *Nearly Zero Energy Buildings Definitions Across Europe*, 2015, http://bpie.eu/wp-content/uploads/2015/09/BPIE_factsheet_nZEB_definitions_across_Europe.pdf

¹⁰ Communication “An EU Strategy on Heating and Cooling”, 16.2.2016, https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v14.pdf