VAKUUMDÄMMUNG - „STATE OF THE ART" UND CHANCEN FÜR DIE GEBÄUDESANIERUNG

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Abstract

During this research program vacuum insulation has developed rapidly. At the beginning VIP was hardly known in the building branch and only a few pilot applications were realized. Only little was known concerning key questions as durability, gas tightness of envelope materials, behaviour under humid and hot conditions. Today it can be stated that VIP properties are well known and some important weaknesses have already been eliminated. We now have well documented experiences from the building site which have been implemented by the building industry for their VIP developments. The VIP production has been professionalized and the VIP have been better adapted to the needs of building applications.
Today we see a very broad interest in the VIP technology from the building branch and large number buildings in which VIP have been applied. But the quantitative wide use of vacuum insulation is still hindered by mainly two factors:

- high price
- lacking confidence in VIP technology and their use in building applications

1 Today cost

The work under the annex has shown that for the design of vacuum insulated constructions one may not use the thermal conductivity of VIP just after production of ~0.004 W/(m·K) but 0.006 to 0.008 W/(m·K). Hereby the already high material cost rise to a level which hinders strongly the mass use. Even when gains by space savings and constructional simplifications are considered, the resulting costs are hardly acceptable for standard insulation applications. Unfortunately today just little advantage is taken of the regained liberty to develop low U-value building parts with new slim designs. VIP is mainly used in special applications where further advantages are obtained. In renovations by the use of VIP, additional expenses can be avoided, as for instance the lengthening of the roof when insulating the façade. Often VIP is used as a problem solver, e.g. for terrace insulation, VIP is here the only possibility to prevent a step between the heated room and the terrace.
That today the rather crucial direct use of unprotected panels has become the common practice on building sites, has its reason probably also in the high VIP prices. Only very innovative producers of prefabricated insulated building parts (sandwich panels, doors, façade systems etc.) do invest in the new technology. Many others hesitate because they assess VIP as too expensive to be used in their products.

2 Cost reduction potentials

To achieve a distinct higher market share it is absolutely necessary that VIP prices come down. To estimate how and to what extent price reductions are possible, it would be interesting to know the main cost factors for VIP production. Unfortunately we only have limited information on that topic. For example, it is known that the materials (core and envelope materials) represent quite a high portion of the total cost. With the envelope materials, it can be assumed that it is mainly the production quantity which defines the price. However, fumed silica is already a mass product. Physically it seems to be possible to reduce the portion of fumed silica in the board or to replace it with a cheaper material (e.g. organic foam). In particular the latter requires tighter films to maintain a lower pressure in the panel. Such high barrier films are not only needed for VIP with other core materials but also for (building) applications in more humid / hotter environments. This kind of extreme high barrier film is also developed for other applications (e.g. OLED) which have similar demands. It is therefore quite probable that they will be available soon.
Furthermore the production of VIP is still dominated by expensive manual work. But the portion of the automated production steps has increased in the last years. This development must lead to a price reduction in the near future.
For the next five to ten years, it can be assumed that VIP solutions will remain more expensive than conventional constructions with the same U-value. This is also caused by the fact that conventional insulations are being improved.

3 Quality assurance

Annex 39 has also contributed to increased confidence in VIP. For instance it was shown that the environment in the main building applications allow a VIP service life of 50 years and more.
Actions are needed in the field of quality assurance. It has to be made sure that the VIP applied in a building do not get damaged during handling and installation processes. Through systematic measurements of the internal pressure of the panels, defective specimens can be tracked down and crucial processes identified. The today available measurement technology is only partially suitable for quality control of the whole process chain. Ongoing developments lead to the conclusion that in the near future a cheaper and more easily applicable measurement device will be available.

4 Official certification

Another obstacle are missing product approvals for VIP and VIP based systems for buildings.