

INSULATION

Multi Foil Insulation Has Its Shiny Image Tarnished

By Andy Wilson

Tri-Iso Super 10 is the name given to a multi-layer foil based insulation product produced by the French company *Actis*. *Super 10* is the latest in a line of multi-layer foil products produced by *Actis*. Although it is only about 30mm thick, *Actis* claim that tests have shown that it has the same insulation value as much greater depths of mineral wool. This has led to great interest from within the building sector. *Super 10* is more user-friendly than mineral wool and its lesser bulk means it can be deployed much more easily in confined spaces.

Although mineral wool (more commonly known in Ireland by its brand name *Rockwool*) has something of a reputation for being the poor man's insulation, there are few products on the market which have been proven to achieve an equivalent thermal resistance (the 'R' value) with a significantly less depth of material. Any new product capable of achieving the same thermal resistance with only one sixth the depth of material would revolutionise the building industry.

Actis's claims, however, appear to defy the laws of physics. Although *Tri-Iso Super 10* is credited with being able to efficiently reflect back radiant heat losses, most heat losses from buildings occur as a result of convection or conduction. Furthermore, the radiant heat losses which occur are proportional to the relative temperature of the surface which is radiating heat, meaning they



would be greatest from doors, windows and other relatively warm surfaces. According to *Actis*, the test carried out on their behalf showed that "under certain conditions *Tri-Iso Super 10* outperformed [200mm of] mineral wool."

Independent Tests and Research

A number of individuals working in the sustainable building sector were not convinced that the full story was being told by *Actis* and decided to carry out their own small scale tests. Although far from conclusive, the results suggested that the multi-layer foil insulation might not be the miracle product the manufacturers claim ¹.

Then in July 2005, the *Building Research Establishment* (BRE) in the UK investigated two buildings in Scotland which had been fitted with *Tri-Iso Super 9*, the predecessor to *Super 10*. The results of the study² indicated that the thermal resistance of the *Super 9* was about 1.71 m²K/W. *Actis* had claimed a figure almost three times as great. The research carried out by BRE was funded by the ODPM (*Office of the Deputy Prime Minister*).

The BRE findings have some serious implications. Anyone assuming that a building insulated with *Tri-Iso Super 10* (or other similar products) will be compliant with building regulations is likely to be disappointed. The architects who specify such products and the building engineers who sign off houses insulated with them may be leaving themselves open to litigation from clients who will understandably be very angry that their new home is not insulated to the required standard. No figures are available for the number of houses insulated with multi-layer foil products, but in Ireland alone it could be in the thousands. Sales appear to be booming and the findings of the BRE study have not been widely published. Far from asking questions, many build-

ers are recommending *Super 10* or its contemporaries to clients and are delighted to have found a product that is so quick and convenient to install.

Testing in Ireland

In late December 2006, *The Sustainability Institute* set up a small test facility at premises just outside Westport in Co. Mayo. The object of the test project was to compare various insulation products, including *Rockwool*, *Tri-Iso Super 10* and *Kingspan*. The latter is a urethane foam board. It was decided to use a 200mm depth of *Rockwool*, and a 120mm depth of *Kingspan*. Independent data suggests that *Kingspan* and other urethane boards have a thermal performance some 30-40 percent better than quilt insulation products such as *Rockwool*.

Three identical test boxes with an internal volume of about 1.2m³ were constructed using 44mm x 44mm timbers at centres of approximately 400mm. To provide insulation from the cold concrete floor, the boxes were placed on a 60mm layer of *Kingspan*. Each box was fitted with a 180 watt tubular electric heater, wired to a digital thermostat set for 20° Celsius and connected to its own dedicated electricity meter.

In accordance with manufacturer's recommendations, the seams of the *Super 10* were taped in place with proprietary tape provided by *Actis*. The 200mm depth of *Rockwool* was made up of two layers each of 100mm. Two layers of 60mm board were used in the *Kingspan* test, with the joints staggered.

The test room was unheated throughout the entire experiment and had a permanently open doorway leading into another open room which lead outside. As a result of heat escaping from the test boxes, the air temperature in the building was usually 1-2° Celsius warmer than outside. The initial test was run for one week. Over the fol-

lowing two months, a total of twelve additional tests were carried out. Two new products, namely *Holzflex* (a product made from wood fibres) and *SheepWool* were introduced from test 7 onwards.³ In order to be able to accurately compare results from different tests, each new test retained two of the materials used in the previous one. Only one test box was changed each time. A third natural insulation product, made from hemp, was introduced at test 13. All test boxes were clad with a layer of *Solitex* breathable membrane.

The Results

On average, 75 percent more electricity was required to heat the *Tri-Iso Super 10* box than the *Rockwool* box. The relative performance of the two products varied quite a bit according to the prevailing weather conditions outside. During very cold or windy weather, the *Super 10* performed particularly poorly. Both of the natural insulation products tested out-performed the *Rockwool*. The *Holzflex* was particularly impressive. Unlike the *Rockwool*, the natural insulation products were pleasant to work with. The sheep's wool product was easily damaged and care was needed during installation.

The technical specifications of the *Rockwool*, *Holzflex* and *SheepWool* had indicated that these three products have a broadly similar thermal performance. For this reason the same depths of insulation were used in the tests for each of these products. The available data also suggested that 120mm of urethane foam was roughly equivalent to 200mm of *Rockwool*. In the test situation however, the box lagged with 120mm of *Kingspan* required approximately 16 percent more energy than the *Rockwool* box. This highlights a possible shortcoming of this product, namely that 'best practice' is difficult to achieve.

An article in *Construct Ireland* (Issue 8 Volume 2) by architect Joseph Little suggested that the heat losses through cavity walls could be tripled if the cavity insulation (typically urethane foam board) were fitted badly. Although the 120mm *Kingspan* used in the test was fitted moderately well, there was still room for improvement. Owing to a measuring error, some pieces were cut about 10mm short and as a result did not fit tightly together. This gap was taped over with ordinary parcel tape.

A second test was carried out using only 60mm of *Kingspan* but this time great care was taken with the cutting and fitting. All the seams were taped thoroughly. Most interestingly, the difference in energy requirements of the two *Kingspan* tests was only about 20 percent, thus confirming the importance of good practice when installing insulation. Compared to *Tri-Iso Super 10* however, the 60mm of well fitted *Kingspan* came out well ahead.

The Environmental Benefits and Impact of Insulation

Any full appraisal of insulation must acknowledge the environmental impact of the production process. Important considerations include resource depletion, embodied energy (the energy required to manufacture the product), production-related pollution, and health risks to the labour force or to those living close to manufacturing plants. Generally speaking, the synthetic insulation products score exceedingly poorly on most of these counts. Although the deployment of insulation in buildings will result in greater energy efficiency, it should not be assumed that these benefits always outweigh the environmental footprint of production. Insulation products made from natural fibres have a much lower environmental impact. These issues will be examined in detail in the next issue of *Sustainability*.

¹ see www.greenbuildingforum.co.uk

² *The thermal performance of multi-foil insulation* by T.Ward and S.Doran

³ *Holzflex* is manufactured by *Homa-therm*. In Ireland it can be obtained from *Ecological Building Systems*. (see advert on page 60)

SheepWool is manufactured by *Sheep Wool Insulation Ltd.*, Unit 1, Railway Business Park, Rathdrum, Co. Wicklow. www.sheepwoolinsulation.ie t: 0404 46100

All the insulation materials used in these tests were kindly donated by the manufacturers or their Irish agents/suppliers.

At the time of going to press the results from the tests using the hemp insulation were not available.

200mm Holzflex



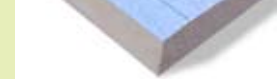
200mm Sheep Wool



200mm Rockwool



120mm Kingspan



Tri-Iso Super 10



No Insulation

