Glass & Glazing PRODUCTS

MAY 1997

Environmental challenges ahead

Following the British Plastics Federation's defence of PVC in *GGP* (April, p43), Dr *Tony Chapman, lecturer in sociology at the University of Teeside, argues the glazing industry must reconsider its use of PVC.**

One of the main attractions at this year's Ideal Home Exhibition was the Pilkington K Glass House. The house, designed by Charles Frost, promised to provide light, space, airiness and happiness – together with low cost heating. The claim that the house could achieve higher levels of energy efficiency was based on the use of Pilkington K, a low emissivity glass with a transparent coating to allow the sun's heat to enter the house but restrict heat loss from the inside. Additionally, the height of the glazed section of the house will allow heat to rise into the gable and be drawn into the attic where a heat exchanger can transfer the energy to water which is then stored underfloor, or may be used to heat a swimming pool.

As Charles Frost told me at the show: "The taller the structure, the better it will work. In this structure, I've got the capacity to move 15 to 30 air changes an hour, that's every two to four minutes. And that is with all the doors and windows shut because we have trickle vents around the windows."

Given the acreage of glass in this structure, it would surely be the ultimate dream house from the point of view of the glass and window frame manufacturers – and the window cleaner.

In the context of a show, it is fun to idealise the perfect living space – but for the majority, the cost of a house like this would be well beyond their reach. In fact, Frost's business is built upon demand from the rich and famous who want to build big conservatories and swimming pools on to their existing houses.

Nevertheless, the exhibition feature raises some interesting issues for the future of the glazing industry. Some builders are now beginning to fit low emissivity glass as standard – Saxon Homes of High Wycombe claims to be the first property developer to use Pilkington K Glass as standard on its development of 15 executive homes at Burghfield Mill near Reading. Certainly, those architects who want to experiment with more glass may need to consider low emissivity glass in order to meet the requirements of the Building Regulations.

Pilkington claims that 'if all the single glazed windows in houses in the UK were double glazed with Pilkington K Glass, it would save £1 billion worth of energy. That's enough to power a city the size of Liverpool for a whole year.'

The glazing industry

The glass industry could make a very considerable contribution to the reduction in energy consumption. This would help reduce CO^2 emission which has been identified as one of the main 'greenhouse' gases that cause global warming. In Britain, it is estimated that about 28% of CO^2 emissions come from households. This could be reduced dramatically if houses were properly insulated and used energy efficient appliances.

But will the public invest their money in energy efficient products like low emissivity glass and high specification window frame insulation? Recent research by Mintel for the Energy Saving Trust (EST) shows that the average household wastes £278 a year in energy costs due to poor insulation. In fact, only three homes from its study of 7,004 were fully insulated. There is some evidence to suggest that people are becoming less likely to buy environmentally friendly goods. For example, a market research survey published by Mintel in 1995 shows an 11% drop in British anxieties about environmental issues between 1990 and 1994. In the same year a MORI poll indicated an 8% decline in the number of consumers who selected products on environmental grounds from its peak in 1990.

Many consumers have become suspicious of green marketing after a number of product scandals where the ecological advantages of manufactured goods were exaggerated or non existent. This problem has recently been tackled by the EST's campaign on the installation of energy efficiency and insulation products. Its director Dr Eoin Lees, stated: "The initiative has been launched in response to research which highlighted that consumers found the subject of energy efficiency confusing and wanted a truly independent signposting scheme to help them make their purchasing decisions. Anybody buying a product, service or measure where they see the Energy Efficiency symbol can be confident that it will incorporate the latest technology, enabling them to save money on their energy bills."

This campaign has moved its emphasis away from the earlier Go for Green programme on to the money saving argument. The campaign slogan, produced by Saatchi and Saatchi 'Energy Efficiency – it's clever stuff' will appear in shops throughout Britain.

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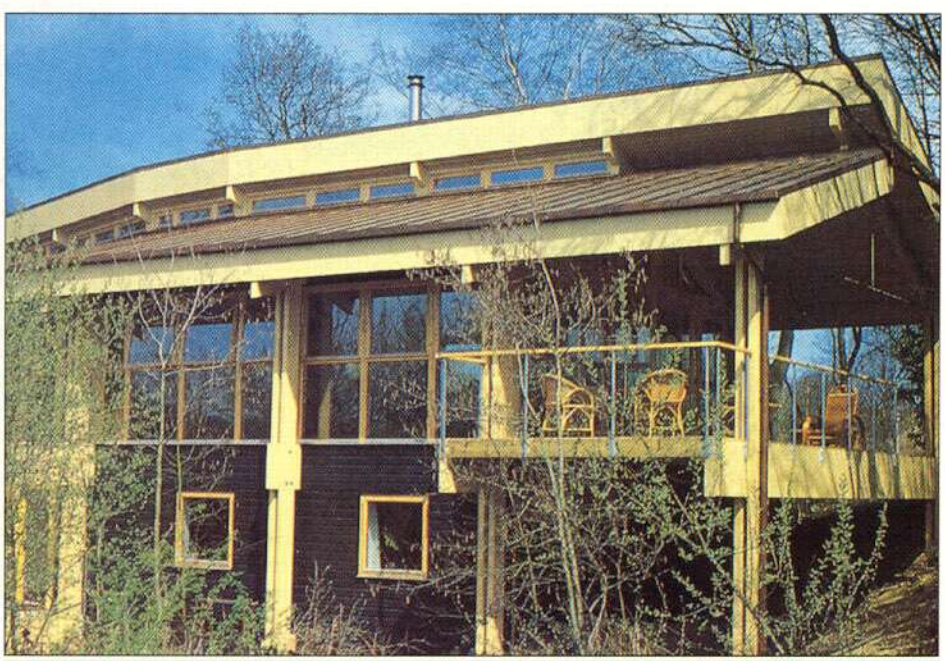

Low energy and low environmental impact house built by Michael Winter and Elizabeth Monk near Tonbridge Wells using Swedish Window Company products.

**The views expressed by the author are not necessarily those held by the magazine.*

PVC use in buildings

Social housing project for young people in Schoneberg, Berlin. The restored building is completely PVC-free.

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We need to be cautious about stressing too much emphasis on cost-benefit analysis in consumer decision making. As Robert Vale, the prize winning environmentally concerned architect recently told me: "People quite cheerfully pay an enormous sum of money on a car which is almost worthless after ten years and nobody ever says, 'Oh dear, that's not a very good pay back, is it'. If people were rational, they'd all buy a Skoda, but they don't. They want a BMW at three times the price."

The fact that most consumers do not want to invest in energy saving goods may be a problem for the producers of low emissivity glass and highly insulated window frames. The rest of the industry which sells on the basis of low price, enhanced status and increased comfort for the householder may win over the majority of consumers, in the short term at least.

In the longer term, the balance might tip in the other direction as government, under pressure from the international community, increases its expectations on energy efficiency.

Environmental impact

It is to be expected that the glazing industry tends to focus on the advantages of its products in reducing energy use. It is becoming clear, however, that other environmental issues that concern the industry will need to be addressed in the very near future. The most important of these is the extensive use of PVC.

It would be very unwise for producers of PVC windows to sit on their laurels in the expectation that their product will continue to be regarded as 'environmentally friendly'. In fact environmental pressure groups worldwide have turned their attention to the detrimental ecological and human impacts of both the production and eventual disposal of PVC.

Although this has not yet become a sensitive issue in parliamentary debates on the environment in Britain, the evidence against PVC has been mounting for some time. In Sweden the Ecocycle Commission reported in 1994 that PVC should be phased out no later than the year 2000. In October 1994 the Austrian Supreme Court defined PVC as an 'environmental poison'. Denmark is currently considering a proposal to phase out PVC by 2000 and a number of countries have restrictions on PVC use including Luxembourg, the Netherlands Norway, Sweden and Japan. It is only a matter of time before Britain is persuaded to come into line with the international community.

The industry has responded to criticism to some extent and has attempted to defend itself by stating that the production process has been transformed over the last few years. For example, by 1992 only 14% of US PVC products was manufactured using mercury in the chlorine separation process. Limiting the use of mercury is a step forward but the production of chlorine itself causes most concern.

The PVC industry is the top worldwide consumer of chlorine, using about 30% of the chlorine produced. Other big users include the paper industry, pesticides and pharmaceuticals. PVC domestic products include drain pipes, tubes, cladding, electrical insulation,sheathing, flooring and of course, window frames.

Estimated UK end uses of PVC

Pipes and fittings	31%
Windows and doors	24%
Packaging	14%
Wire and cable	10%
Coated fabric/paper	6%
Floor and wall coverings	6%
Other uses	9%

Source: 'What's Wrong with PVC' Greenpeace, November 1996.

The PVC production process creates a number of environmental hazards, the most dangerous of which is the production of dioxins. Dioxins are complex and chemically stable compounds that are now found in the atmosphere, soils, water, vegetation and all animals including humans. A recent Greenpeace report, What's Wrong with PVC? shows that in people, their presence is dangerous as they decrease testosterone production, may increase the chances of developing diabetes and produce changes to the immune system. They can pass through the placenta into a developing foetus and build up in breast milk.

Other chemicals used in the manufacturing process also cause problems. PVC is not of much use in its raw form and is mixed with other polymer resins and plasticizers (derived from fossil fuels). The most common plasticizer is di-2-ethylhexy phthalate (DOP or DEHP). Used in many plastic products, it was suspected as a carcinogen as early as 1987 when it was found to be leaching into blood bags. The Environmental Protection Agency's toxic release inventory thinks that about 1 million pounds of DOP are released into the air annually.

Cadmium and lead are used by many manufacturers as stabilisers – although they are progressively being replaced with calcium-zinc and barium-zinc formulations. Vinyl Chloride which poses a major toxic threat if it enters ground water, has been identified as a carcinogen and has been controlled and monitored since the 1970s. In the USA an entire community near to the Georgia Gulf PVC factory was relocated after a leak.

At the other end of the product cycle, the burning of PVC also produces dioxins. Mark Strutt, of Greenpeace, told me that 'Dioxin has been redefined this February by the International Agency for Cancer Research as a Class 1 carcinogen. It is the most potent synthetic chemical known to man.'

Dioxins are produced when chlorine is incinerated and its dangers have recently been highlighted by the UK Fire Brigade Union. When PVC burns, hydrogen chloride forms – when this meets water it produces hydrochloric acid. The acid adds to the damage to buildings. But more dangerously from fire-fighters' point of view, if it is drawn into the eyes or lungs, it also transforms into hydrochloric acid.

Even when PVC is buried, additives including phthalates and heavy metals can leach out into the water table. PVC products do not biodegrade – an alarming prospect given that the world produces 20 million tonnes of PVC every year.

From Greenpeace's viewpoint, PVC in particular and chlorine in general need to be phased out. As Mark Strutt says: "If you didn't have chlorine production you wouldn't get dioxins. About 50% of world production of chlorine goes into the production of PVC. We'd like to see a complete phase out of PVC and the eventual sunsetting of the chlorine industry."

Consequences for glazing

There have been attempts to reduce chlorine use in other industries. In the Canadian paper industry, for example, there have already been successful efforts to remove chlorine completely from the manufacturing process. Wire and

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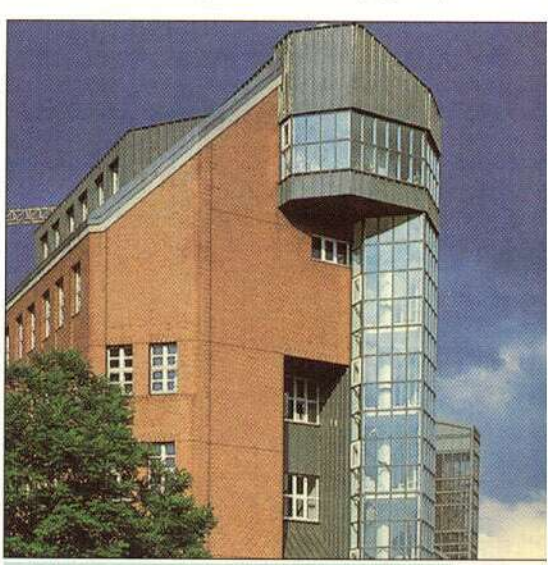

Part of the new Museum of Transport and Technology, Berlin, which is being built largely without PVC.

PVC use in buildings

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cabling industries have found alternative ways of sheathing and there are many durable alternatives to vinyl flooring.

There will be growing pressure upon the building industry to move by example. The Sydney Olympic stadium is largely PVC free. The London Underground has banned the use of PVC cabling because of the hazards highlighted by the King's Cross fire in the 1980s. The Channel Tunnel is PVC free. A number of local councils in Germany have stopped using PVC in their building programmes and the more environmentally aware councillors and planners in Britain are seeking advice on alternatives to PVC in their own building programmes.

There are alternatives to PVC available to the glazing industry, including hardwoods from sustainable sources, metal windows and softwoods. Advances in timber window technology have brought their level of energy efficiency into line with the best performing PVC windows. Furthermore, their durability and aesthetic appeal may be attractive to consumers, especially given the recent spate of reports on problems of warping, cracking and coloration of PVC frames.

Hardwood windows, if properly maintained last much longer than PVC. But the accessibility of hardwoods from sustainable sources can be a problem because the practice of certification is as yet in its infancy. The situation is improving as the Forest Stewardship Council has established a system of certification and endorsement of timber products.

The town hall in Alexanderplatz, restored 1990–1997, largely without PVC.

There have been cases of abuse, but a total boycott of hardwood imports could accelerate the destruction of the rain forests because hardwood logging produces valuable income for third world countries. If that was income lost the forest may be turned over to cattle ranching.

It would be better if the forests were left completely alone, of course, but that just isn't going to happen. Consequently, the emphasis has to be on sustainable management of the forests. This approach is promoted by World Wildlife Fund and Friends of the Earth. By the year 2000, the United Nation's International Tropical Timber Organisation hopes that all international trade should be based only on sustainable managed forests.

Other companies use softwoods successfully. The Swedish Window Company, based in Colchester, for example uses Scandinavian Redwood Pine. Its highest performance windows produce U-values as low as 1.0W/m^2 °C and noise reduction as high as 41RW:dB. The softwoods come from sustainable forests and the production process requires far less energy than PVC or metal windows and of course, avoids the production of serious chemical contamination. Where hardwoods are necessary, for the patio window and door sills, the company uses Iroko, a hardwood from sustainable sources in the Ivory Coast, West Africa.

A final alternative is to leave things as they are. Given that existing frames in older properties have been shown to withstand the test of time, there may also be a growing market in sealed low emissivity double glazed units. Certainly, there will be a market among the many householders who want to keep original frames where possible.

There are alternatives to PVC and those companies that are alert to the likely imposition of pressure to reduce PVC use may well steal a march on the rest of the industry in the future.