#3692

The Energy-Efficient Refurbishment of high-rise flats in Sandwell.

By Don Ward

The Sandwell high rise flats

There are over 4,500 blocks of flats of six storeys or more in the UK. Many of these flats are difficult to heat, having inadequate and expensive heating systems and poor levels of insulation by modern standards. To compound the problem, the majority of blocks are occupied by tenants on low incomes. As a result, the tenants cannot afford to heat their flats adequately, and the flats can suffer acute condensation.

Sandwell Metropolitan Borough owns 120 high-rise blocks of flats, accounting for over 25 per cent of their entire stock of 56,000 dwellings. Following a pilot scheme in six flats, undertaken by Midlands Electricity Board in 1985, they decided to refurbish three blocks, incorporating a package of energy efficiency measures. The blocks were twelve storeys high, of Wimpey 'no-fines' construction, each containing 96 flats. The council's main aim in incorporating these measures was to eliminate condensation and mould growth by ensuring that all flats are heated to an adequate standard. To do this, the heating cost had to be reduced to a level which low income households could afford. The main features of the package were:

- insulated dry lining of all external walls and stairwells, combined with insulated panels added to the bottom half of full height windows, reducing the calculated U-value of the walls from an average of 2.6 W/m2K to less than 0.5 W/m^2K;
- a new electric heating system, consisting of Economy 7 off-peak storage heaters in the living room, hall and one bedroom, supplemented by wall-mounted downflow fan heaters in the kitchen and bathroom and a panel convector in the other bedroom.

The package also included draughtstripping of windows and the front door, insulation to the exposed ground floor and extra insulation to the roof to bring the thickness up to 100mm. The Economy 7 tariff allowed a cheaper and more flexible water heating system than before.

The measures were installed at the same time as new kitchen units, with the tenants still occupying the flats. The cost of refurbishment was about £2000 per flat, of which the cost of the energy efficiency measures was between £1100 and £1400, depending on the size and position of the flat within the block.

Following the refurbishmennt, BRECSU appointed Wimpey Laboratories to monitor a trial group of thirty flats in two of the blocks for a year, from October 1987 to September 1988. A similar number of flats in a nearby uninsulated block were also monitored as a control group.

The average saving realised by tenants in the trial flats for space heating and hot water was £79 over the year, or 32 per cent, compared with the control group. This benefit excludes an additional monitored reduction in other domestic use, which may be due to a lower use of auxiliary heating, the more flexible Economy 7 tariff or demographic differences. There was also a substantial temperature benefit during the heating season, with living rooms on average 5°C

warmer and the main bedrooms 3°C warmer. Surface condensation problems, which were severe in the control flats, were eliminated in the trial flats, and no evidence of interstitial condensation was found. All tenants expressed themselves well satisfied with the improvements, and considered the upheaval experienced during installation to have been worthwhile.

Using the BRE Domestic Energy Model, BREDEM[1], it is possible to quantify the overall benefit of the reduced electricity bills and increased temperatures, by calculating what it would have cost the tenants of the control flats to achieve the same temperatures. This gives a value to the benefits of about £300 per flat per year.

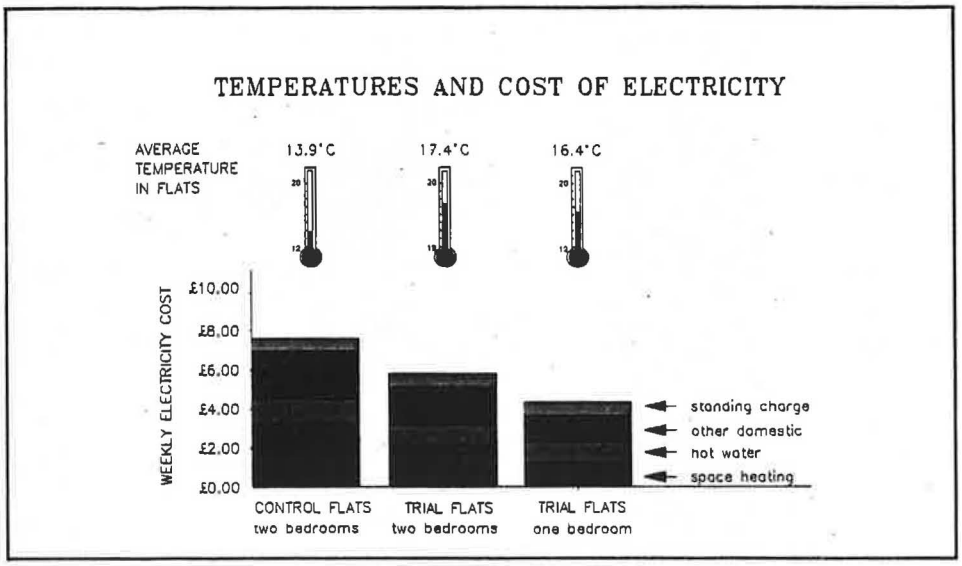
Whilst it is not strictly relevant to compare savings realised by a tenant with an investment by the landlord, the simple payback period in purely energy terms is under five years. Taking into account the elimination of condensation problems, and consequent reduction in maintenance and redecoration costs, the reduction in complaints to the housing department and increased occupation, it is clear that there are direct benefits to the Local Authority, though these are not as easy to quantify.

A second BRECSU Demonstration in high-rise flats is just getting underway at Knowsley Borough Council, near Liverpool. This scheme uses an overcladding system applied to the outside of the block. Similar energy benefits are expected, and existing problems of rain penetration should be prevented.

If such techniques could be applied to all high-rise blocks, not only would a significant part of the housing stock be transformed into more comfortable and attractive dwellings, but the value of the energy benefits would total around £80 million per year.

Further information on BRECSU projects is available in the form of project profiles and expanded project profiles. These can be obtained free of charge from the BRECSU Enquiries Bureau, Building Research Establishment, Garston, Watford, WD2 7JR. Tel 0923 664258. Don Ward, BSc, is in the Housing section of BRE's Building Energy Efficiency Division.

(1) BREDEM – the BRE Domestic Energy Model: background, philosophy and description. BR Anderson, AJ Clark, R Baldwin & NO Milbank. BRE Report, 1985. (24)



ETSU: (continued from page 27)

Figure one illustrates how variations in the waste disposal credit affect the income required from steam sales from a CHP facility, in order to maintain a three year payback. In this case electricity is valued at 2.8 p/kWh.

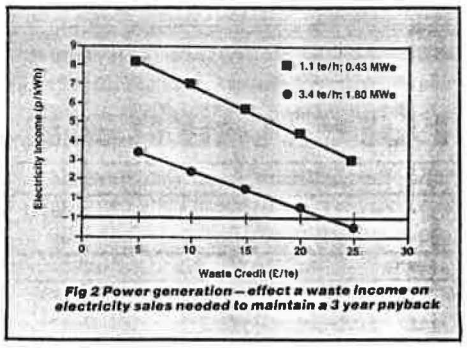


Fig 2 Power generation – effect a waste income on electricity sales needed to maintain a 3 year payback

Figure 2 is a similar diagram for a power-only facility. It should be emphasised, however, that these are only intended to illustrate the basic analytical principle and individual case circumstances should be more closely examined.

Bearing in mind the current costs for hospital waste disposal, the projects would appear viable over a range of scales of operation and waste income. The minimum disposal credits required to maintain a payback of three years in the above examples, based on steam sales of £1/GJ (approximately 10p/therm) and electricity sales of 2.8 p/kWh, are listed in Table 1.

In general, CHP is the most attractive option, especially where the plant operator is also the steam user; steam under these circumstances may be worth as much as £3/GJ, but when sold to others may only be worth £1 - £2/GJ. Nevertheless, the disposal fees required for both CHP and power-only schemes are not unreasonable, and a good case could be argued for using hospital wastes to generate power.

However, the viability of such measures will depend on:

- the cooperation between neighbouring hospitals;
- whether sufficient in-house expertise exists to run such plants;
- whether good quality waste can be obtained as an additive to improve the combustion characteristics.

One possibility is to consider involving a private utility or energy management company who, in collaboration with the private waste disposal industry, have shown interest in financing and operating such schemes.

Further information

Steve Dagnall, the ETSU project officer for waste as a fuel, will gladly answer any queries on this sector. Queries of a more general nature should be addressed to Energy Efficiency Enquiries Bureau, ETSU, Building 156, Harwell Laboratory, Didcot, Oxon, OX11 0RA. Tel No: 0235 436747. (23)

Table 1
Minimum disposal credit required to maintain a 3 year payback

Option	Boiler rating (MW_t)	Useful power (MW_e)	Waste disposal Credit with steam @ £1/GJ (£/te)	Waste disposal Credit with steam @ £3/GJ (£/te)
CHP	3.0	0.22	21.72	5.25
CHP	9.3	0.73	7.99	−8.95
Power-only	3.0	0.43	25.94	25.94
Power-only	9.3	1.80	7.69	7.69