

NOVEMBER 1988

Energy Efficiency Demonstration Scheme Expanded Project Profile 121

Separate Boilers for Space and Water Heating

A demonstration of energy savings in elderly persons' housing

Potential users

Operators of buildings using combined boiler plant for space and water heating.

Investment cost

£7,000

Payback period

6.2 years

Savings achieved

Fuel: 2,925 therms (14%), worth £1,024
Maintenance: £104

Host organisation

Anchor Housing Association
13-15 Magdalen Street
Oxford OX1 3BP

SITE OF DEMONSTRATION

St Clement's Court
Fiddler's Lane, Irlam
Lancashire

The aim of the project

In many buildings, large boiler plant has been installed for the centralised supply of space heating and hot water. Owing to its size, the boiler plant prevents adequate matching to load demand and, consequently, the overall operating efficiency of

the system is low, particularly during the summer months. In this demonstration, two oversized boilers were replaced by two separate boilers for space heating and two gas-fired water heaters for hot water generation. It was anticipated that fuel savings of 15% would be achieved not only by improved load-matching and efficiency, but also by the closing down of the space-heating boilers during the summer months. Savings of this order were achieved.

Monitoring contractor

R W Gregory and Partners
135 Dickenson Road
Manchester M14 5HW
Tel No: 061-248 6411
Mr R Poff

Equipment manufacturers

SPACE HEATING BOILERS
Potterton International Ltd
Emscote Road
Warwick CV34 5BQ
Tel No: 0926 493420

WATER HEATING BOILERS
Andrews Industrial Equipment Ltd
Dudley Road
Wolverhampton WV2 3BP
Tel No: 0902 58111



How energy was saved at Irlam

The sheltered accommodation provided for the elderly by the Anchor Housing Association often takes the form of individual self-contained units (flats or maisonettes) within a large block. The majority of these properties are built to a common plan and internal layout, and contain large boiler plant for the centralised supply of space heating and hot water. Because of the size of the boiler plant, adequate matching of boiler plant to load demand can rarely be achieved, and the overall operating efficiency of the system is low, particularly during the summer months.

The Anchor Housing Association have, for many years, recorded the fuel consumption figures in their housing stock. Since the occupancy pattern is similar in all buildings throughout the year, these figures reflect the performance of each building and highlight "rogue" blocks that use energy excessively. The records are also useful in showing the effect of energy-saving measures that have been installed. In 1982, as a result of their observations, the Association devised a scheme to improve the efficiency of their boiler plant. This scheme was applied to one of their blocks of sheltered accommodation, a block comprising thirty-one self-contained one-and two-person flats, on a site at Irlam, Manchester.

St Clement's Court was built with two gas boilers (rated at 117 kW each) and two storage calorifiers (675 litres each). This plant provided a combined output of 234 kW for a maximum load requirement of 172 kW. In winter, when space-heating demands are high, the boilers were working near their maximum output and operated most efficiently. In summer, however, although one boiler was turned off, the remaining boiler, which was used solely for the supply of hot water, was operating very inefficiently at well below its maximum output. A further prime reason for the reduced efficiency of the system was the continued circulation of the heated primary water through the second, cold, boiler, resulting in loss of heat to the pipeways. In general, the wardens of the flats are not expected to operate large valves to close off unwanted plant and, furthermore, a close-down procedure for summer operation was impracticable because space heating might be required at short notice in the event of a cold spell.

The existing plant was replaced by two space-heating boilers (73 kW each) and two gas-fired water heaters (17.6 kW each) for hot water generation. The new system used existing pipework, valves and controls, and the combined output of 181 kW closely matches the load requirement of 172 kW, with overall efficiency much improved. The dual-boiler plant ensures that heating is always available to the elderly tenants. Furthermore, in the event of a boiler failure, a service, albeit at a reduced level, could be maintained.

A 25% grant towards the replacement and installation of the plant, together with the full cost of independent monitoring, was provided under the Energy Efficiency Office's Energy Efficiency Demonstration Scheme.

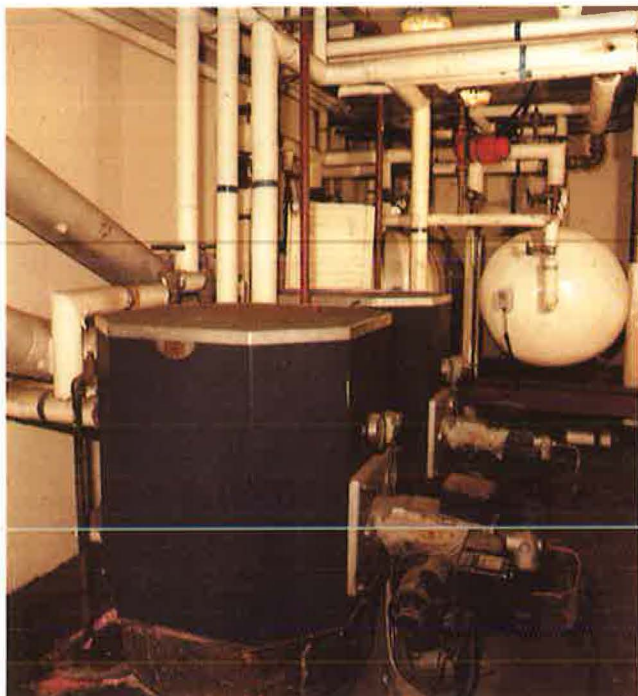
To determine the energy savings, an identical adjacent block, Holly Court, was also monitored. This block retained its original heating plant and was used for a comparison of heating requirements and to ensure that the same comfort levels and service were maintained within the two blocks.

As well as saving energy, the new plant proved quieter in operation and required less maintenance than the plant in Holly Court: furthermore, it occupied less space which, in turn, facilitated access and maintenance.

Anchor Housing Association

The Anchor Housing Association is one of the major associations providing accommodation for elderly persons in sheltered homes. Their estate currently comprises 15,000 flats in 430 buildings situated throughout the UK. The Association is a non-profit making body which is registered as a charity.

The Anchor Housing Association are fully aware of their energy needs through the records of fuel consumption in their buildings. The Irlam demonstration, together with the fuel records and other energy-conscious schemes, have enabled the Association to produce a design guide for building services. The guide provides service consultants with a detailed brief for new design. The Association are continuing to improve their housing stock, reducing the energy demands by measures such as draught stripping, insulation and boiler plant improvement.

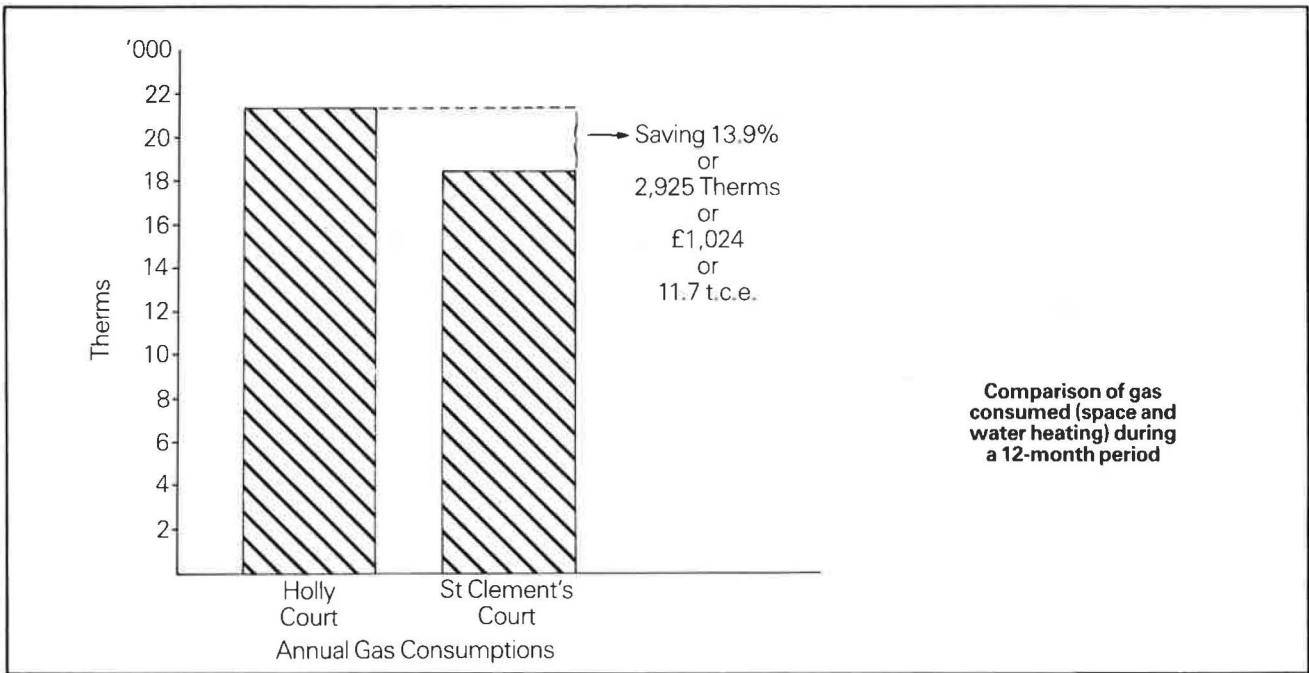


Energy and cost savings

Interviews with tenants revealed that comfort levels in St Clement's Court were adequately maintained, and there was no shortage of hot water. Average internal winter temperatures have been maintained at a level similar to those in Holly Court, while the hot water supply temperatures were, on average, 5°C higher.

The accompanying graph illustrates the difference in total gas consumption in each block for the period June 1983 to

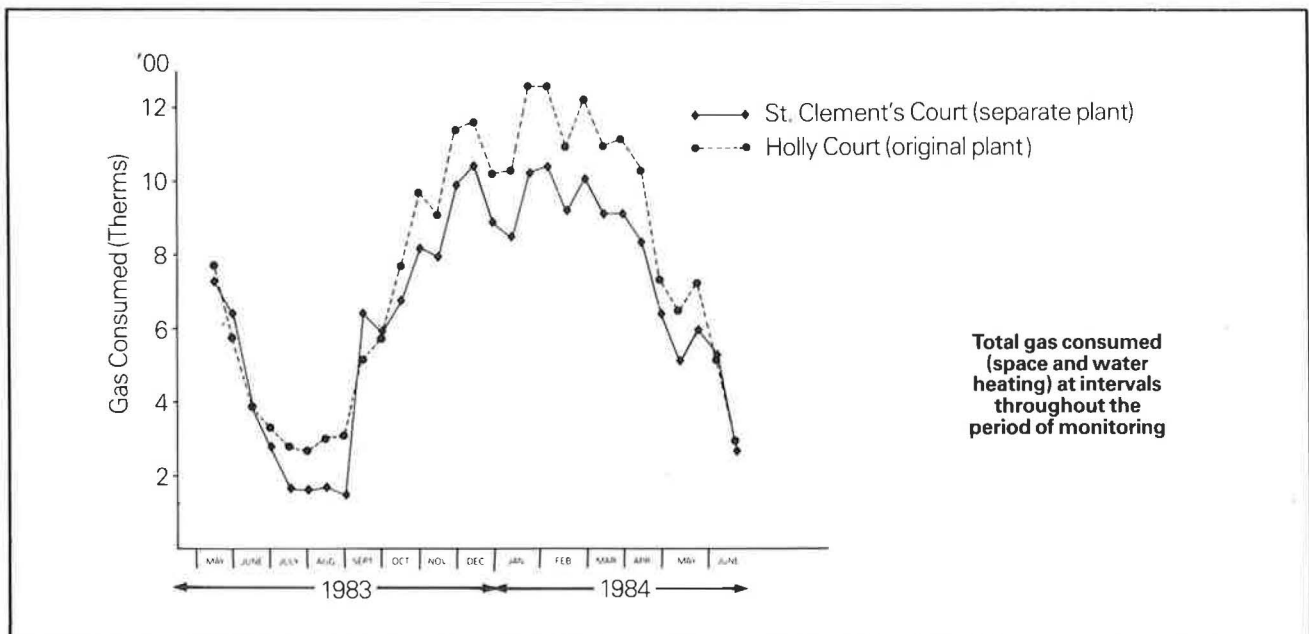
May 1984. Comparison of the two buildings indicates a total gas saving of 2,925 therms (11.7 tce) for this period: this is equivalent to nearly 14% of the fuel consumed by the original boiler plant in Holly Court and represents a cash saving of £1,024. Reduced maintenance charges for the new installation saved a further £104, giving a total saving for the twelve-month period of £1,128. The payback period, based on the £7,000 investment cost for plant and installation, is about six years.



Potential replication

In England alone there are over 258,000 sheltered homes for the elderly. If half of these dwellings could benefit from the replacement boiler scheme, 48,000 tce/year could be saved, worth over £4 million/year. The Anchor Housing Association are adopting the boiler replacement scheme in other sheltered dwellings when plant requires replacement, and also in new-build schemes.

The scheme need not be restricted to sheltered dwellings. Any building which uses combined boiler plant could benefit by separating the space and hot water heating. Other suitable properties include schools, colleges, factories, offices, etc.



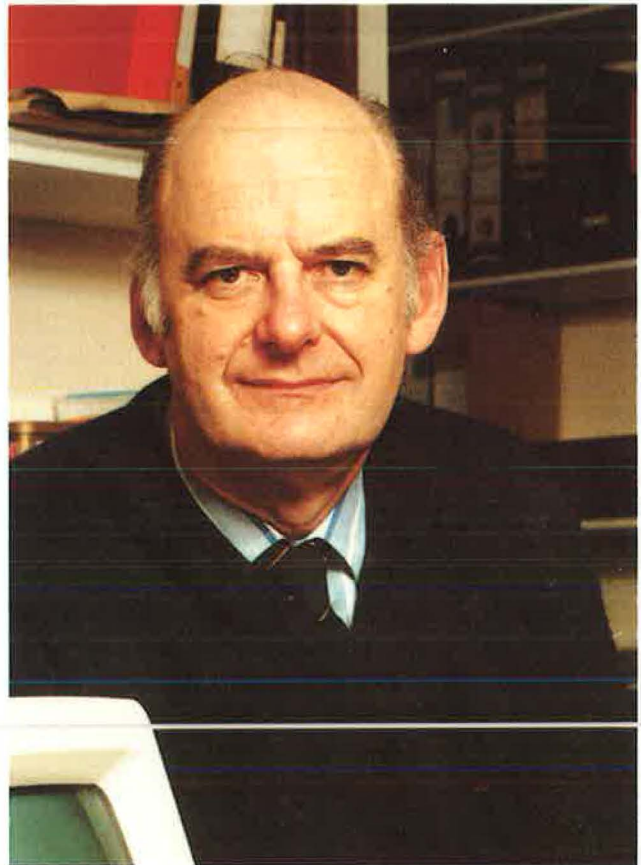
Anchor Housing Association's experience

"During the past eight years, we have recorded the fuel consumption at 350 sheltered housing developments, of which 300 use gas for space and water heating, the remaining 50 being "all electric." The energy conservation measures which we adopted led to the conclusion that there was little to be gained from the use of more sophisticated heating controls. However, following detailed analysis of our heating systems, we estimated that gas-boiler plant was less than 40% efficient, when measured over a 12 month period. The plant in all the buildings is similar, comprising two boilers and an indirect storage cylinder, so that for most of the year the boilers are operating well below maximum capacity. Even in very cold weather there is little increase in gas consumption in most buildings.

We established the hot water requirement and draw-off pattern to size the water heaters properly. The results of this survey showed the need for revision of the currently published criteria. It also became clear that considerable energy savings could be made by matching the boiler capacity nearer to the net load. One method by which this may be achieved is to separate the space and hot water heating. The simplest and cheapest arrangement is two boilers for space heating and two direct storage heaters for hot water, each sized for half the net load.

These preliminary studies showed how extensive fuel records may be used to predict the effect of an energy conservation measure in a practical rather than a theoretical way. The demonstration project at Irlam proved that annual gas savings of the order of 14% may be obtained by separating the space and hot water heating loads. At the same time an adequate heating and hot water supply is maintained, with no degradation in levels of comfort for the tenants and no increase in work load for the Warden. In addition, the reduced plant noise improves the tenants' environment, and lower maintenance costs benefit the Association.

As a result of the demonstration, Anchor Housing Association have adopted the policy of incorporating the scheme in new buildings, and in old installations when the renewal of boiler plant is essential. Shortage of funds prevents existing equipment from being upgraded as a matter of policy. If we could replace all our boiler plant, the annual gas bill would be reduced by £400,000 (at present prices), and we would save, annually, about 1.2M therms of gas."



A handwritten signature in black ink that reads "C D Fox". The signature is written in a cursive style and is positioned above a horizontal line that extends to the right.

C D Fox
Principal Engineer

Best Practice programme

The work described here was carried out under the Energy Efficiency Demonstration Scheme. The Energy Efficiency Office has replaced the Demonstration Scheme by the Best Practice programme which is aimed at advancing and disseminating impartial information to help improve energy efficiency. Results from the Demonstration Scheme will continue to be promoted. However, new projects can only be considered for support under the Best Practice programme. For copies of reports and further information on this or other

projects, please contact the Enquiries Bureau at the:
Building Research Energy Conservation Support Unit (BRECSU)
Building Research Establishment
Garston
Watford WD2 7JR
Tel No: 0923 664258
Fax No: 0923 664097
Information on participation in the Best Practice programme and on energy efficiency generally is also available from your Regional Energy Efficiency Office.