1960s detached bungalow Wiltshire

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Case study 6

£1,469 Saving on fuel bills

59% Reduction in carbon emissions

Measures installed	Total cost	Annual CO_2 saving (tonnes)	Annual fuel bill saving
External wall insulation	£16,702	2.73	£556
Double glazing	£8,713	1.42	£291
Ground source heat pump	£18,505	3.19	£622
Mechanical ventilation with heat recovery	£2,980	0.00	£0
Total package	£46,900	7.34	£1,469

The home

This detached bungalow was built in the mid-1960s with a coal boiler, single glazing and no insulation.

An oil boiler had subsequently been installed, leaving coal as the secondary heating in an open fireplace.

The loft had also been insulated to a depth of 200mm.

The property has been privately rented for some years, and the current tenants were frustrated that the costly oil heating was delivering little benefit, so they would often retreat to the sitting room and build a large coal fire to keep warm.

What they did

The owners were aware that the thermal performance of this house could be improved, but that this was likely to be expensive. A detached bungalow tends to be difficult to keep warm, as it loses heat from every external wall as well as the roof and floor. As the loft had already been done, the next step was to insulate the solid walls externally, and then to install double glazing. Once this was done, a ground source heat pump became a viable option to replace the oil boiler, and the finishing touches were a ventilation system with heat recovery and a wood burning stove in place of the open fire.

Plans for the future include installation of solar water heating, which can be integrated with the heat pump fairly easily, and solar photovoltaic (PV) panels for the generation of electricity.

"Before the eco measures were in place, the tenants consumed £600 of oil in December 2010 alone. Now this sum is expected to cover heating for a whole year"

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Double glazing

The glazing installed was A-rated for energy and cost £8,700 in total. It features a 28mm gap between the panes and the edges are sealed with plastic rather than metal, which is known as a "warm edge". The glass itself has a low emissivity coating which reflects heat back into the room. The windows were replaced before the walls were insulated, helping to ensure a neat and effective finish.

External wall insulation

The external wall insulation is made up of 100mm phenolic foam board, fixed to the walls with both adhesive and mechanical fixings. A basecoat render is added, reinforced with mesh, and then finished with a coloured silicon render topcoat. The total cost for this measure was £16,700, including replacement of all soffits and fascias and construction of timber "bonnets" over the bay windows which were previously flat roofed. Careful detailing was required to ensure good weatherproofing around the new roof join.

Installing external wall insulation

Ground source heat pump

The owners wished to move away from expensive and high-carbon oil central heating. With improved insulation and draught proofing, a heat pump became a viable option. This would previously have been unsuitable, and could have increased heating costs because it would have needed to work extremely hard and run at high flow temperatures, raising its electricity consumption, in order to maintain the temperature in a poorly insulated home.

The owner of an adjacent field allowed a ground loop to be installed. This does not prohibit the continued use of the land for arable farming, as the collector is buried around 1.5-2.0m deep. The existing radiators and piping were power flushed, two radiators were added and a plant room was constructed to house the new equipment. The total cost of the heat pump, including the ground-works and plant room construction, was £18,505.

Ventilation with heat recovery

The next measure installed was a mechanical ventilation system with heat recovery. This reduces the need to open windows, minimising uncontrolled heat loss.

Extractor units in the kitchen and bathroom, driven by a central fan in the loft, remove warm, moist air and expel it to the outside, once it has passed through a heat exchanger. The heat exchanger captures the heat from the outgoing air and uses it to pre-warm incoming fresh air supplied to the dining room and main bedroom. The system can recover around 90% of the waste heat but modelling the exact savings is difficult as this is dictated by user behaviour.

Installing the heat recovery system in the loft was relatively straightforward, and extra loft insulation was added afterwards.

Energy consumption	Total (kWh)	Per m² floor area
Before improvement (2007)	43,685	419
After improvement (2010)	13,119	126
With all possible measures	3,987	38
UK average (2011)	19,800[1]	217[4]

CO_2 emissions	Total (tonnes)	Kg per m² floor area
Before improvement (2007)	12.46	119
After improvement (2010)	5.12	49
With all possible measures	1.95	19
UK average (2011)	6.00[2]	66[4]

Running costs	Total	Per m² floor area
Before improvement (2007)	£2,788	£26.73
After improvement (2010)	£1,319	£12.65
With all possible measures	£814	£7.80
UK average (2011)	£1,032[3]	£11.34[4]

Possible next steps	Annual CO_2 saving (tonnes)	Annual fuel bill saving
Wood burning stove	1.02	84
Solid floor insulation	1.28	260
Solar hot water	0.34	74
Solar PV (1 kWp)	0.53	95
Total	3.17	513

[1] Ofgem 2011
[2] English Housing Condition Survey 2011
[3] Ofgem 2011
[4] Based on 91m² from English Housing Condition Survey 2011

Energy performance and carbon emissions in the Target 2050 exemplar homes have been modelled using the UK Standard Assessment Procedure (SAP). The savings data presented here is based on a standard occupancy pattern. This may not reflect actual usage by the building's current residents but is used to compare homes of different sizes and types in a way that assesses the building itself rather than the behaviour of any particular occupant.