People Exploring Low Energy Homes

www.openecohomes.org
www.cambridgecarbonfootprint.org

Bury Road, CB22 5BP

Bill and Valerie Powell – Bill says:

When we inherited our house I saw the opportunity for an eco project, and to make the house ready for the next 50 years – to make it '**future proof**'.

I used to work for Warwickshire Borough Council as a Housing Portfolio holder, which made me acutely aware of just how much need there is in the UK for a model of a l**ow cost, reliable, simple, efficient, flexible**, and **easy to install heating system**.

After extensive research I found that **Underfloor heating and fan assisted radiators (Ecovectors)** would reduce energy and be suitable for many forms of heating, therefore future proof.

I discovered an **Exhaust Air Heat Pump** being used in Scandinavia – a new thing – so I looked for suppliers, and found a low cost British source.

Overview

Age, Type: **1957, Semi- detached**

Wall type, Floor area: **Brick cavity, 135 sq m**

Project timescale: **1 yr**

Cost of heating system: **£10,000**

Energy usage – 2 adults

49 kWh per sq m pa electricity (2011)
22 kWh per sq m pa gas (2011)

Key features

+ insulation: cavity walls, loft, extension, underfloor
+ windows and doors: double-glazed, triple-vents
+ exhaust air source heat pump system: simple, low cost, easy to install
+ exhaust air source heat pump
+ heat recovery system: Bill's own design
+ flueless gas fire, ecovector radiators
+ underfloor heating system: low cost, easy to install
+ underfloor heating pipes: laid in 'pug', supported on insulation between joists
+ photovoltaic (PV) cells
+ heating controls: careful timing
+ high performance appliances
+ induction cooker
+ water conservation: water butts, low water toilets

The beauty of the system I've designed is that it could be done by any local plumbers – there are no unusual skills needed to install it.

Low Energy Measures

Building works included extending and developing the kitchen, and adding a fourth bedroom upstairs, but the main focus was on **energy efficiency and the heating system i**n particular.

The **cavity walls had been insulated** already. During the building work **new walls were insulated** to current standards and **loft insulation was** topped up. Windows and doors are **double-glazed with trickle-vents**. **Low-energy lights** are fitted in all rooms.

An **Exhaust Air Heat Pump** in the airing cupboard draws in air from the kitchen-diner below, **extracts and concentrates heat** from it, and blows out cold air through the loft. (The flue once used used for a kitchen stove serves as an air duct)
This provides **Hot Water** and heat to the **underfloor and Ecovector heating system**.

A flueless gas fire in the kitchen-diner pre-heats the air in winter if necessary, and **fan-assisted Ecovector radiators** heat the bedrooms and hall. The **underfloor heating materials** were relatively **low cost**, and **installing it was simple.**

Underfloor heating pipes were laid in a 25mm dry **sand and cement 'pug' mix** supported on a 50mm layer of **insulating foam between the joists**.

However the upheaval of **renewing the floor system** was the most expensive element (£4,500 ground floor approx.).

Photovoltaic (PV) cells were recently installed.

System Performance

The **Exhaust Air Heat Pump copes well** with outside temperatures down to 7ºC, and with help from the flueless gas fire down to 0ºC.
During the coldest months of 2010, the **immersion heater** was occasionally used.

Savings

A a **68% energy improvement** over its 1957 build standard, was reported when the **Sustainable Energy Academy** inspected our re-furbishment

Our heating cost £767 in 2010. I estimate the cost would have been £1,400 with normal radiators and a condensing boiler.

Electrical power for other purposes has fallen from over 7,000 kWh in our previous house to about 3,000 kWh per year.

Value for money: This system cost £10,000. This could have been reduced to under £7,000 if I'd used Ecovectors throughout instead of underfloor heating.

Future Plans

I am looking forward to greater energy efficiency when **fuel cells** become available.

Professional Contacts

Design: Bill Powell designed the exhaust air source heating system.

Builder: Ray Tweddle of Debray Builders, 01223 693982 or 07837 124205

Sustainable Energy Academy: Old Home Superhome www.superhomes.org.uk

Products and Costs

Total cost of project: £110,000, including £10,000 for the heating system.

Photovoltaic (PV) cells: 10 x 1950 watt cells, £6,275, installed by Midsummer Energy www.midsummerenergy.co.uk

Insulation

Underfloor: Insulated by 50mm insulation board (Celotex) as part of underfloor heating.

Exhaust Air Source heating system

Underfloor heating materials: piping, pumps, controls from Wundafloor www.wundafloor.co.uk (£1500)

Exhaust air source heating pump: Ecocent 300L from Earth Saving Products www.esavep.com (£1,800)

Ecovector radiators: models LL1200 and LL2000 from www.smiths-env.com (4 x £260)

Flueless Gas Fire: Typical cost £350 for 2 kW model from B&Q.