Isle of Wight
Open Homes

Old Barn
Shalfleet

The house we bought

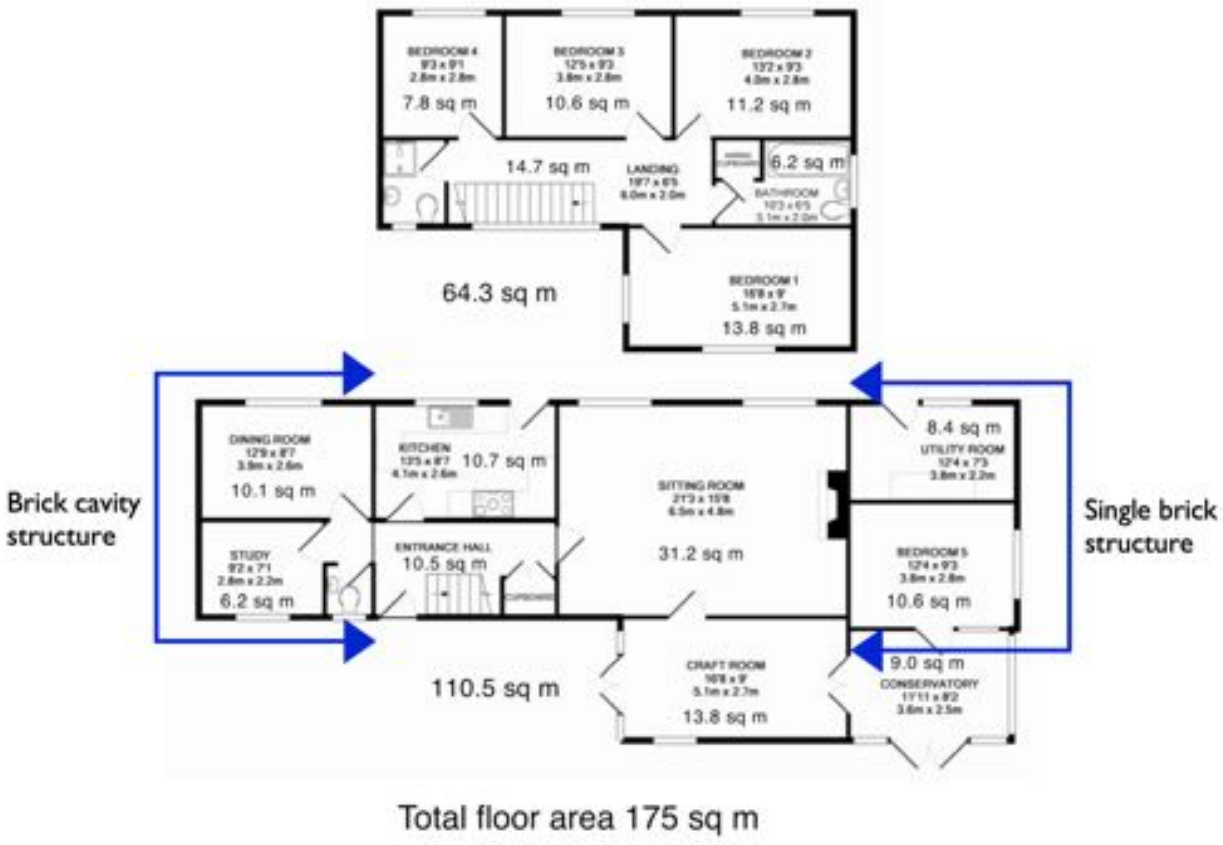
We bought our house in early 2012. We had been hunting for a plot of land where we could build an eco-house, but after two years of searching we gave up and bought the Old Barn. The name is deceptive. There was once a stone barn on the site and some of the existing external walls date from then, but the house as it is now was built in the 1970's.

It has solid stone external walls, with an internal skin of concrete block, placed close up against the stone, so there is no continuous cavity that can be filled. The roof was concrete tiles and the windows and doors low quality uPVC.

The heating was oil, using a Grant combi boiler with a rating of 60kW.

The EPC rating was a low D. According to the certificate there was little scope for improvement.

It had none of the makings of the eco home of our dreams!



The challenges

We understood from the start that we would be unable to get anywhere near PassivHouse standards of insulation. It was impossible to install cavity wall insulation in the main house, though possible in the brick built north extension. External insulation would totally destroy the appearance, so the only option was internal wall insulation (and of course loft insulation).

All the floors are solid floors, again making it challenging to improve the insulation levels.

The windows and doors were double glazed with low quality uPVC structures. Many seals were poor, so draft levels were high.

The heating system could be changed. The oil boiler was massively over-sized and the combi water heating very inefficient. Every time even a small quantity of water was required, the whole boiler had to rumble into life. The radiators were old fashioned high temperature designs, so it was hard to set up the boiler to be in condensing mode.

What we did

We focussed on three key areas:

- Insulation upgrades where feasible
- New heating system (this was 2012 when heat pumps were very expensive and there were no installers on the Island, and no grants)
- Use of solar energy

How we did it

The first thing we did was to build an Excel heat loss model of the house, so that we could see what mattered most and where we should concentrate our efforts and spend.

The most obvious measure was to increase the loft insulation - the easy bit. We also had the cavity filled in the brick cavity-walled extension. The other extension was more problematic. It was presumably built as an outhouse, poorly constructed in single brick. One part had been recently converted to a fifth bedroom. It was to become a study, so we installed loft insulation and internal wall insulation.

It has a low pitch, but south facing roof, so was where we had 3kW of solar PV installed. The solar thermal panels are installed against the wall above, set

at a very steep angle to bias them for the winter sun. We have excess solar energy in the summer.

The conservatory made some contribution to solar gain, but like the rest of the glazing, was poor quality. We decided it was not a priority.

The so-called craft room (which had originally been a garage) had a long blank external wall, so this was a prime target for internal war insulation. We also installed under floor insulation as we were changing the flooring to wood.

The wall on the other long side of the house was punctuated with doors and windows, and we judged that the cost and complexity of internal wall insulation was not justifiable.

There was little more we could do to the fabric of the house.

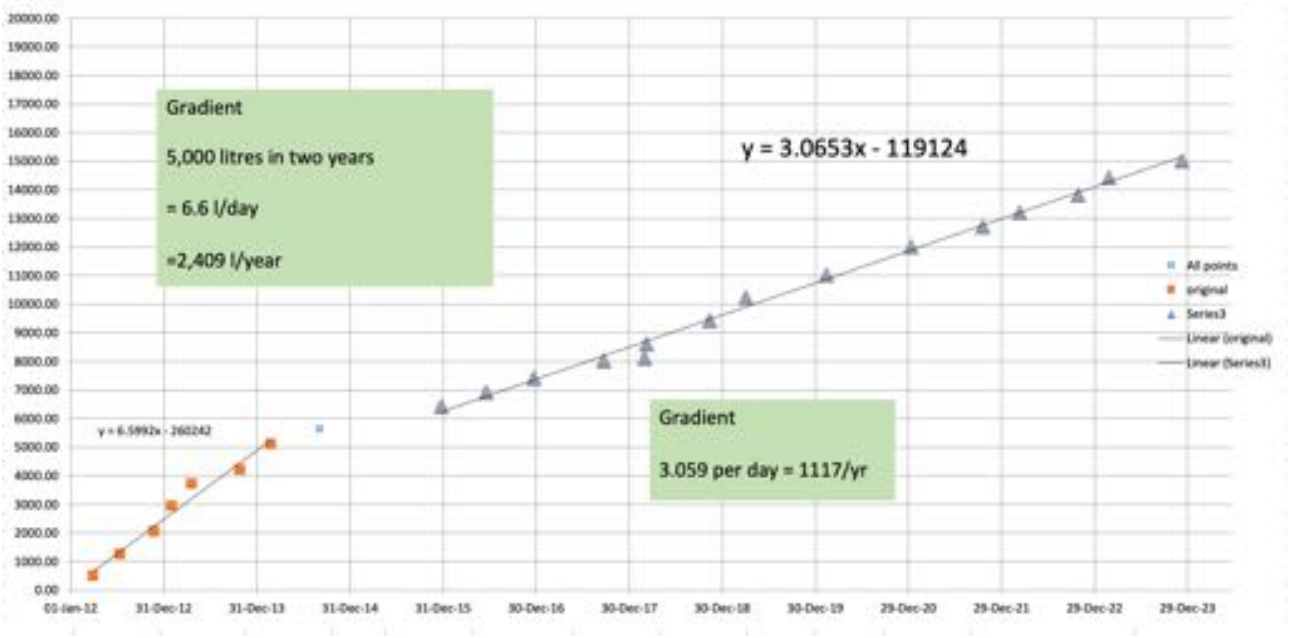
The most complex challenge was the heating system. We designed a hybrid system, using a small system oil-fired boiler, large pressurised water tank and a mix of solar thermal and solar PV, the latter working through an Immersun diverter. In the main living area we installed an over-sized wood burning stove. We also replaced many of the most important radiators with larger, low water content models.

The Excel model indicated that under most conditions (external temperatures down to 0C), a 20kW boiler would be more than adequate. It would run for a lot of the time, but as that increases overall efficiency, no problem. We were unable to find an installer prepared to take on the job to our specification, particularly to fit a boiler of this size. Typically they recommended much larger units. Fortunately, we found an individual tradesman who I worked with to do the install.

We also specified an over-sized pressured hot water tank, the logic being that we would dump excess solar energy into it as a heat store, which would carry us through days of low irradiance.

Did it work?

The quick answer is yes. The oil consumption was halved - it dropped from 2,400 litres per year to 1,100 and the solar system provided 100% of hot water from around mid March through to mid October.



The house floor area is 175 sq m and the original EPC estimated an energy use of 238kWh/m^2, so 41,650 kWh. The energy content of oil is 10kWh per litre so our annual energy use is little more than a third of this: 11,000kWh for oil and 4,000kWh for electricity, a total of 15,000kWh. This huge difference has no doubt got a lot to do with the measures we have installed, but also reflects our lifestyle. If we were a younger family of four with children, it would no doubt be higher, but still a lot less than predicted by the EPC.

What else?

More recently we have changed all the windows and doors to much higher quality Velfac units. We stuck with double glazing as the advantages of triple glazing were very small. The main benefits of the new windows are much reduced drafts and significantly increased glazed areas, including getting rid of the pseudo-Georgian bars so we now have unobstructed views.

We also had a larger, wood framed conservatory installed.

Bother these are luxuries in the sense that they cannot remotely be justified on energy saving grounds, but both improve the habitability of the house.

What next?

We are thinking of fitting an air source heat pump and a heat recovery vent into the main room/kitchen. We would like more solar PV capacity, but our connection capacity is severely limited by the DNO restrictions.

We have a Nissan Leaf EV and in March will be a triallists for the installation of a V2H charger, which is in part why we have not fitted a battery in the house. There is 20kWh sitting outside on four wheels after all. Also, the extra large hot water tank acts as a heat battery, so means that our water heating costs are zero for around 8 months of the year. There would not be much left over for a battery.