

Priors Farm, Wiltshire

This case study provides details of a biomass boiler in a large domestic house.



Figure 1: Priors Farm

Background

Priors Farm is an old, six bedroom farmhouse. It has been renovated and has a modern two storey extension. The house has a ground floor area of 207m² and a volume of 518m³; the first floor is 207m² and 476m³. This gives a total area of 414m² and volume of 994m³. A swimming pool is due to be installed in the near future, it will be heated during the summer to 20°C. The majority of the heating is under floor.

A 40 kW log boiler was installed at the property in the autumn of 2008 and provides around 85% of the heating and hot water requirements of the property. Mr Rausch's primary considerations for converting the system were economic and environmental reasons. He has a farm and forestry business.

Heating requirements

The house was previously heated by a 58.6 kW (200,000 btu) Grant oil boiler which was installed in 2005. The space and water heating requirements of the house consumed an average of 10,000 litres of oil per year. This equates to approximately 93,500 kWh at 85% efficiency. The addition of a swimming pool could possibly double this. The oil boiler was located in an outbuilding across the drive approximately 15 metres away from the house and linked by 32mm Ecoflex district heating pipe also installed in 2005.

Project development

Initially advice was sought from the AONB in June 2007 who put the owner of the property in touch with the Centre for Sustainable Energy (CSE). At the time, CSE were running a regional programme called the South West Co-ordinated Woodfuel Initiative. This provided a free site visit and mini feasibility study undertaken by an independent expert which gave the owner all the information needed in order to make a decision on the viability of woodfuel for the property. Based on the report received the owner decided to go ahead with an installation. Unfortunately, this programme has now ceased.

Boiler choice

The feasibility study suggested that the existing boiler was oversized and therefore inefficient. It recommended that a 25 kW automatic wood chip boiler that also had the capability of burning waste grain would be an appropriate system.

However, a log boiler was the preferred option as this provided a cheaper solution and could utilise wood off cuts produced from the owner's forestry business. On the down side, log boilers require more day to day involvement with daily activities including fuel loading and lighting as well as ash removal.



Figure 2: Vigas 40kW log boiler and accumulator tank (left).

Heating plant

After careful consideration, the owner decided to go with the services of Dunster Woodfuels. The chosen system was a 40kW Vigas log boiler installed along with a 2,000 litre accumulator tank. The latter enables the storage of hot water to cater for any peaks in hot water usage. The existing oil boiler provides additional back up in times of peak need during winter.

Fuel Supply and Storage

The annual consumption of woodfuel in the boiler is expected to be in the region of 20 tonnes. The combustion chamber of the boiler is loaded twice daily.

Operation and Maintenance

Log boilers are more “hands on” than automatic wood chip and wood pellet boilers. Despite taking up time, the majority of activities associated with these boilers are very straightforward. Outlined below are some of the typical activities associated with the Vigas boiler and the average time taken and frequency of these.

Figure 3: Logs used in the boiler



Lighting the boiler (5-10 minutes every day)

This should be done as follows:

- Open flue lever
- Open both top and bottom doors
- Remove ash if necessary
- Place firelighter in top firebox and light
- Build a small fire over the fire lighter with dry kindling
- Fill boiler firebox with dry logs and allow fire to get established with both doors open
- When the fire is established close the top door
- Once the temperature reaches 60°C close the bottom door and pull the flue lever closed
- Press the red button and the display will read “heat on 75°C”
- Check the readings after 15 minutes and the temperature should be between 60-75°C.

Stoking the boiler (5 minutes, twice a day)

This should be done as follows:

- Open the flue lever
- Press the red button once and the blue button once. The display will show “ventilation” and present a count down timer. Wait until it has gone to zero
- Carefully open the top firebox door. (Beware of blowback)
- Use a fire iron to agitate the fire to settle it into the firebox
- Load logs into the fire box, packing them in as tightly as possible
- Close the top firebox door and close the flue
- Press the red button once so the display says “heat on 75°C”
- Check sound, smell and sight for anything untoward and make sure temperature readings are not over 80°C
- Make a note of the time the boiler was stoked

Ash removal (10 minutes, 1-2 times per week)

This should be done as follows:

- When the boiler is out, open the flue lever and both doors
- Using the fire irons provided rake the ash in the top firebox so that it drops through the downdraught slot. Leave about 100mm (4 inches) of ash in the firebox
- Using the appropriate fire iron rake the ash off the fire bricks taking care not to disturb the bricks
- Let the ash fall into the bottom firebox
- Using a shovel remove the ash from the floor of the bottom firebox and place in the ash bin



Figure 4: Boiler house

Capital and Operational Cost

The overall capital cost of the installation was £15,000 including VAT at 5%. This includes the following:

- The boiler delivery, installation and commissioning
- All the pipe work, sensors, accumulator tanks and flue
- Plumbing into existing system

A grant of £10,000 was obtained from the AONB. Unfortunately this funding stream is no longer available. However, other grants are available from the following sources:

- Low Carbon Building Programme www.lowcarbonbuildings.org.uk
- Bioenergy Capital Grant Scheme (Round 4) www.bioenergycapitalgrants.org.uk

The property is still using some oil, but the consumption of oil has been drastically reduced.

Carbon savings

Based on annual oil consumption of 10,000 litres of heating oil the current CO₂ produced is 26.8 tons which equates to 7.31 tons of Carbon.

Summary information

Boiler type	40 kW Vigas log boiler
Installer	Dunster Woodfuels
Capital cost	£15,000
Amount of wood fuel used	20 tonnes
Savings compared to oil	£3,600
Grant	£10,000
Payback	1.5 years

Contacts

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