Case Study: Wood Gasification Boiler Heating for an Exposed Rural Family Home

eco angus
wood burning boilers

Simple solutions for greener heating

Fuel cost assessment following thirty six months of operation

Summary

Objective: Deliver constant heating temperature at low operating cost

Solution: Angus Super 40kW Wood Gasification Log Boiler replacing existing oil system

Fuel source: Own wood supply, waste timber and unseasoned logs dried under cover

Project Payback: Break even in year three with six year cumulative net project savings over £7,000

Learning: Successful boiler position and water tank positioning has been key

Avalon House, North Somerset

ISO 9001 TÜV CERT CE ISO 14001

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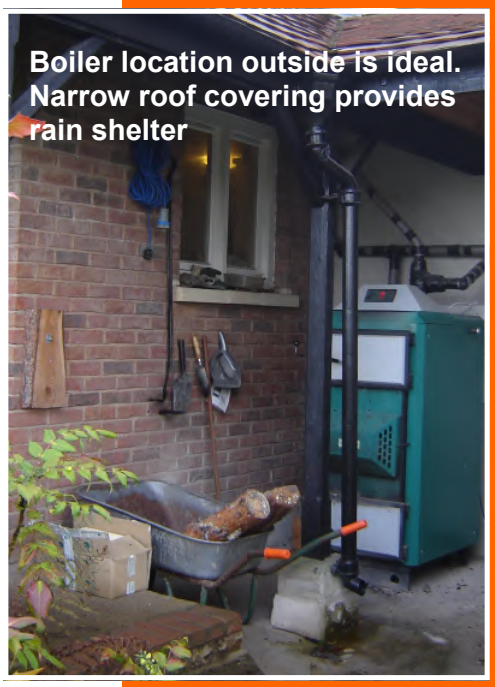
Background

The property owner was upgrading a large detached house in the Mendip hills 700 foot above sea level. The property had an existing oil burning boiler and a wood stove installed in the lounge area, but performance of heating was inadequate for the size of the property and oil bills were high. The location of the property is very exposed to the elements with the result that both oil and wood boilers were in constant use during winter generating high heating bills. In October 2006 the owner decided that he needed to significantly reduce his heating bills.

The owner has access to a small area of woodland along with wood off cuts from a workshop and wanted to utilise this fuel source, supplemented by buying bulk uncut logs.

A heating assessment was carried out and a 40kW Angus Super Gasification Log Boiler with two 1000 litre water cylinders was selected. The installation was carried out within one week and the owner has been operating the wood system for over thirty six months. The property owner summarised his decision to install a wood burning boiler as, "*a simple decision that has made a huge change to the way my family can live in our home without worrying about heating bills*".

- Exposed home generating high oil heating bills
- Angus Super 40kW Wood Gasification Log Boiler selected
- Boiler has been operating for more than three years



Boiler location outside is ideal. Narrow roof covering provides rain shelter

Heating Requirements

The main house comprises thirteen rooms over two floors including five bedrooms, one of which is en-suite. The building is detached, has double glazed wooden windows, brick cavity insulated walls and a pitched roof with above average insulation. The living space and ceiling height is substantial and during the months of October to April, the oil fired boiler was on for at least twelve hours a day. The house was occupied throughout the day as the owner has a young family and consequently hot water is required on demand. A key requirement was that the heating could remain on at a constant temperature as there was a very young baby in the house.

Solution

✓ **Boiler:** An Angus Super 40kW Wood Gasification Log Boiler was selected with one Nad and one Nado 1000 litre accumulation tanks. Wood pellet boilers were rejected as the owner has access to an existing free wood supply on the property and wanted to utilise both unseasoned wood dried out on site and waste wood off cuts.

- Two 1000 litre water storage tanks selected

✓ **Boiler Location:** The boiler is situated in a covered area at the back of the property. The boiler is covered from direct rainfall with a small pitched roof, but the unit remains open to the elements. The total boiler height is 1570 cm and 600 cm wide and is fitted against the north facing back wall of the property.

Water cylinder tanks were accommodated inside the property, creating a large room used for drying clothes and storing linen.

✓ **Project delivery:** The project was completed in a very short period of time. From boiler choice, the delivery was made within two weeks along with the accumulation tanks and additional elements of the heating package, including; Laddomat 21-60 Mixing/Layering Valve,Thermo Safety Valve, Wilo Pump and three Way Valve. Installation was relatively simple as a room already existed in the property for the water cylinder tanks. Installation and commissioning took just three days.

✓ **Wood Fuel Management:** It was estimated that an average of twelve tonnes of wet wood would be required annually (mixed variety hard and soft wood). The property could generate 50% of this capacity and had an existing store of wood to accommodate the first year of operation made up of seasoned wood off-cuts ready to be used immediately. An additional supply of unseasoned hardwood was purchased, split and dried on site in the log store for a minimum of one year. As the property already had a small wood burning stove, there was an existing log store on site.

Wood is collected at regular intervals from the owners own source and unseasoned wood is left to dry for a minimum of twelve months. Wood off cuts form the workshop are utilised immediately if seasoned. Wood is chopped to size using an Angus log splitter just once a year over the course of one week and logs are stored at the correct size to dry out.

✓ **Operation & Maintenance:** Lighting the boiler is done manually and is similar to starting a log stove, taking just five minutes. Hot water on demand and appropriate central heating is maintained by loading the wood chamber as follows:-

May to September	**Loaded every 3rd or 4th day**
October April	**Loaded twice a day (once in morning and once at night)**

The wood supply is kept in an out house and the loading process takes place outside under a pitched roof cover. Ash is removed from the wood boiler once a week and in summer this can decrease to once a month. All ash is mixed with compost to fertilise.

Investment & Payback

The overall capital cost of the project was £7,897 including V.A.T. which at the time was 17.5%. This included purchase of all the individual elements for the new gasification package and installation connection to the existing system. It should be noted that many installation projects may require additional investment to ensure that the boiler and water tanks are housed in a suitable location.

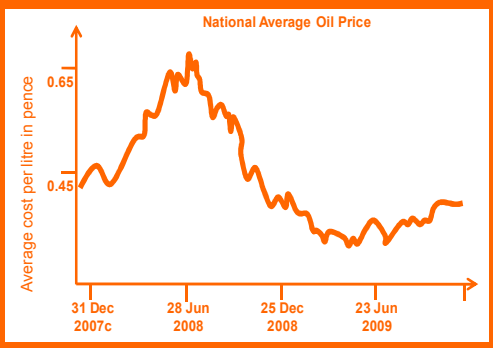
- 50% of wood fuel available for free


Property Wood Store

- Loading wood varies significantly between seasons
- Ash production is minimal

✓ **Fuel Cost Savings:** The table below compares annual cost of wood boiler operation compared to that of oil heating. A range of three prices for oil heating has been supplied recognising the change in oil prices over time. It should be noted that shortly after installation, UK oil prices rose as high as £0.65 per litre and consequently the payback period for this project will have been significantly earlier given the unusually high cost of oil. To generate a fair comparison, £0.45p per litre has been used for comparison to wood fuel costs. Overall, annual consumption of 6,500 litres of oil is compared to 12 tonnes of unseasoned wood.

Daily Average UK Prices (2 Years)



Oil & Wood Fuel Annual Cost Comparison

Wood Fuel Cost			Oil Fuel Cost				Annual Savings		
Wood Fuel (Tonnes)	Cost per Tonne*	Yearly Cost	Oil Fuel (Litres)	£0.35p per litre	£0.45p per litre	£0.55p per litre	£0.35p per litre	£0.45p per litre	£0.55p per litre
12	£35	£420	6500	£2,275	£2,925	£3,575	£1,855	£2,505	£3,155

* Cost of wood fuel calculated at 6 tonnes of delivered unseasoned logs = £45 per tonne. Cost of own fuel supply is zero and so average cost of wood fuel calculated = £22.50 per tonne. Nominal one off cost of splitting wood included (£150) to increase cost per tonne = £35 overall.

- Expected fuel savings of £2,505 every year
- Project break even in year 3

✓ **Project Payback:** To calculate the project payback period the initial capital investment was offset against annual fuel savings as follows:-

Capital Investment	
Boiler (inc. V.A.T.)	£ 4,998
Complete installation	£2,899
Total	**£7,897**

Project Break Even and Six Year Fuel Savings

Based on an average annual fuel saving compared to oil of £2,505 (comparing oil at £0.45p per litre), a six year cumulative fuel saving of £15,030 is generated. Net of the initial capital investment, this equates to a six year fuel saving of £7,133.

Break even point covering the initial investment period was achieved during year three of operation. Although difficult to extrapolate over a long period of time, life expectancy of the boiler is twenty years and this project could deliver net fuel savings of over £40,000 over this period.

At the time, this project did not benefit from a grant and it should be noted that funding can be available to offset capital investment costs. Grant schemes are now available and you can find out more by visiting www.ecoangus.co.uk

Living with the boiler & Learning Points

The following quotes are transcribed from an interview with the property owner and his wife.

✓ **Boiler Location:** *"Placing the boiler outside the property and not being tempted to put it in the garage was a smart decision. Loading the boiler can cause dust and there is sometimes a little bit of smoke ,so the outdoor location is perfect."*

✓ **Water tank Location:** *"One of the big benefits we didn't envisage was how much heat is produced by the water tanks themselves. This room in our house is fantastic for drying clothes and keeping linens and it means we never need to use the tumble dryer for washing."*

✓ **Drying Wood:** *"We did make a mistake early on when I tried to burn semi seasoned wood. The pitch (tar) created needed to be disposed of as the heat exchanger became clogged and I very quickly reverted to using properly seasoned wood. As a minimum, the wood must be kept under cover for a year".*

✓ **Temperature:** *"It took me a while to adjust to the luxury of having a constant heat temperature in the house without worrying about heating bills. Having the heating constantly on and controlled by a thermostat has made a huge difference to how we live in our home."*

Further Information

For more information about Eco Angus wood burning boilers and complete heating systems, visit www.ecoangus.co.uk

You can also arrange a boiler appointment at the Eco Angus Barn by prior arrangement.

Eco Angus Limited
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- Outside boiler location avoids dust
- Water tank inside location creates drying room
- Wood must be dried our for minimum one year
- Efficient heating is created through constant temperature

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