

## 35 kwh Ling Duo Pellet and Log Boiler



### Introduction

**System components:** 35 kwh Ling Duo Pellet and Log Boiler in purpose built boiler house. A custom made accumulator tank with a capacity of about 300 litres has been installed on the first floor of the house. The system can burn either logs or pellets but has only been used with pellets to date. The house also has an Esse stove which is linked to the thermal store.

Fitted September 2007

This system supplies heat and hot water to a stone cottage with a double skin blockwork extension. The boiler is fitted in a purpose built wooden lean-to extension on the gable end of the original stone building. This arrangement allowed the flue from the boiler to be incorporated into the existing chimney breast of the house. The building had an

existing wet radiator system and was heated by liquid propane gas (LPG) which was delivered by tanker. The Esse stove is used for supplementary heating and cooking. This has a back boiler and is linked to the thermal store. The Ling Duo has sufficient output to heat the house without the stove.

Annual pellet consumption is about 6.8 tonnes. This equates to about 32 mwh per annum. Pellets are delivered by courier or the owners transport pellets from a depot.

### Why Woodfuel?

The owners wanted a system based on renewable energy which would contribute to a reduction in climate change. Ground source heat pumps and solar panels were considered.

### Design Parameters

The system was required to:

- Meet all of the heat and hot water needs of the house from renewable sources
- Replace an LPG boiler that had reached the end of its service life
- Operate without requiring daily or day long attention with the same convenience as the LPG boiler. The system was required to be able to supply heat automatically on demand.

### Other Energy Saving Improvements:

In addition to the installation of the pellet boiler the house has had cavity wall insulation fitted in the block work extension, wall insulation in the living room and improved loft insulation. Gaps where drafts entered the building have been filled.

### Installation Process

#### Statutory:

A building warrant was obtained to build the boiler house and fit the boiler.

#### Installers:

At the time of installation the supplier and installer were independent of each other. This required a lot of co ordination. The plumber and installer now work together and this would have made the installation less complicated. Some building work was required to integrate the flue into the existing house chimney and build the boiler house.

### What would have made the process easier?

The whole process would have been easier if one company could have carried out the supply, installation, building, plumbing and electrics, rather than having to arrange for different trades to carry out all of these aspects.

### How easy was it to find information on woodfuel heating?

Much of the information was available on the web. The owner also attended events where Highland Birchwood could give advice, spoke to others who had installed similar systems and phoned suppliers.

The research for the boiler took about 6 - 7 months.

<b>Heat Plant</b>	Domestic
Max output	35kw
Make	Ling Duo Pellet and Log Boiler
Fuel Type	Pellet and Log
Fuel specification	6mm Pellets or logs at 25% Moisture Content
Installation date	September 2007
Backup system	None

Pellet Store Capacity	C. 3 tonne
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Annual Woodfuel Use	6.8 tonnes
Accumulator Tank	300L

### Building

Heated Area	100m <sup>2</sup>
Heated volume	220 m <sup>3</sup>
Building fabric	Traditional Stone with block built extension
Building Use	Domestic
Owner	Private
Nearest town	Dingwall
Region	Highland

### Installation Costs

Boiler House and building work	£3,361
Boiler, accumulator tank and installation	£6,939
Total	£10,300
Grant aid (£)	£4,000
Grant aid %	30%
Source	SCHRI

### Cost Comparison

Previous Fuel Type	LPG
Previous Fuel Cost pa (equiv)	£ 1,900 (at 2008 prices)
Pellet Cost pa	£1,190



## Are you happy with the system?

The owner would prefer the system to be as convenient as oil, without the need to handle fuel from the delivery vehicle to the boiler house and into the hopper. This aspect would be easier if a suitable hopper could be found. The price of fuel was acceptable and compared well with the cost of the previous LPG system. Since installation the price of LPG has risen by about 45%.

The system needs a little mechanical sympathy to operate but this was to be expected with the installation of any new system. It requires a minor service every six months, which can be carried out by the owner with a little bit of training.

There was a mechanical problem at the beginning which required the attention of the supplier. This was resolved quickly and efficiently.

## What would you do differently ?

The boiler was one of the first of its kind, to be installed in Scotland and required the owner and supplier to work closely together. The owner felt that the process would be easier for subsequent customers because lessons were learned on the installation of this system. The process would be easier now that other systems have been installed and the installer has a formal relationship a plumber who specialises in biomass installations.

## Operating the System:

The system has a hopper with a capacity for 165 kg of pellets. This is filled manually from 15 kg bags. In the summer when the boiler is mainly supplying hot water, this lasts for 8 - 9 days. In the winter when heat is also required, the hopper needs to be filled every 3 days. The bags would be difficult for elderly, infirm or shorter people fill, and this was regarded as a limitation.

## Fuel delivery and storage.

Fuel is either delivered to the owner or transported from a depot by the owner. It was not felt that the delivery chain was particularly well developed and it was felt that several aspects needed to be addressed to make pellets as convenient as oil. The building is located on a steep and difficult track, but was previously serviced by an LPG tanker.

Pellets delivered by courier often arrived on pallets, requiring a fork lift for delivery. Where a fork lift is not available, this would be a major problem. The house uses about 435 15 kg bags a year and these need to be carried by hand to the boiler house. This would cause difficulties for the elderly or infirm.

There is also a problem with disposing of the bags.

Fuel was purchased on the basis of convenience and cost. No brand was preferred although there has been an issue with one producer, with a batch of pellets producing an unacceptable amount of ash and slag which prevented the boiler from operating effectively. This issue has been addressed by the producer.

The owner was considering installing a silo that would permit bulk delivery by tanker as this would make operating the boiler more convenient as well as allowing fuel to be purchased at a cheaper price. A bulk silo would enable the boiler to operate without the need for manual filling from bags. The owner felt that the silos that are available at present were not suitable for siting on the property, and hoped that future developments would make them more suitable. At present the minimum delivery by tanker is 4 tonnes.

## Lifetime Costs

Replacing a domestic LPG boiler with an automated pellet and log boiler, plus thermal store.

The comparative cost of heating the house by LPG has been based on an equivalent annual energy supply of 32 mwh

## Assumptions:

The economic climate at the time of writing is very volatile. Interest rates and inflation have been based on 2<sup>nd</sup> quarter 2008 assumptions when finance and inflation was relatively stable. Fuel costs are based on 4<sup>th</sup> quarter 2008.

LPG Gas costs rise at 5% pa. This inflation rate for LPG (5%) will multiply the cost by about 2.5 over 20 years. The current price of LPG has risen 45% in the last six months.

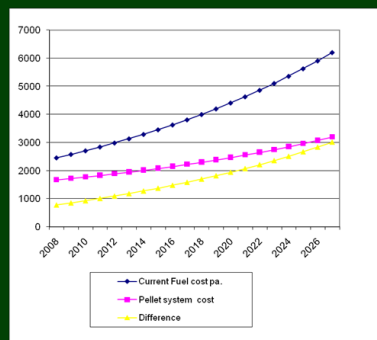
Gas price based on 4<sup>th</sup> quarter 2008 at £0.456 per litre (7.86 p / kwh) Pellet costs have been calculated at £175 / tonne (3.646 p / kwh)

Pellet costs rise at 3% pa. (A lower inflation rate has been used for pellets because it has been assumed that they will not suffer the price fluctuations of non renewable fossil fuels with diminishing reserves)

The capital cost of the boiler is paid over 20 years at 6% interest rate. No capital costs for replacing the gas boiler have been included

Additional heat will be supplied from the Esse stove. This is supplementary rather than the main heat sources.

Based on the above assumptions, the cost of running the pellet boiler in this house will be compared to an LPG boiler in The overall saving in 20 years will be £ 34,600 at today's prices.



Based on the estimated previous use of oil, the energy demand of the building is about 32 mwh per annum. An LPG burning system would produce about 6,85 tonnes of carbon dioxide (CO<sub>2</sub>)

The overall CO<sub>2</sub> emissions from pellets, including manufacture, will be about 2.28 tonnes, or 33% of the LPG emissions.

You can find more information about woodfuel at :  
<http://www.highlandbirchwoods.co.uk> and  
<http://www.northernwoodheat.net/>



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