OPTIWOOD

Improving the Performance and Efficiency of Biomass Boilers

A joint UK-France Project 2018-2020

Case Study 1 – Large Greenhouse-Retail Space

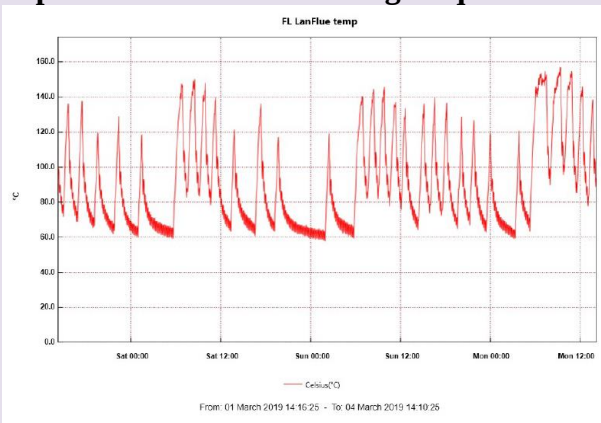
Introduction: Heated by a single 900kW Heizomat chip boiler with 10,000 litre buffer tank. Uses 30-45% moisture content wood chip fuel. No fossil fuel back-up boiler.

The boiler system has a very basic set-up with limited controls. The design heat load has fallen considerably since the boiler was commissioned with a peak load now 40% of the boiler capacity. The buffer tank is exposed to weather and with indoor insulation only.

2018-19 Heating Season – Data Results and Recommendations

The initial data logging and on-site assessment revealed significant inefficiencies. These included very frequent boiler cycling due to the reduced demand on site and the limited controls through the buffer tank. The buffer tank was also losing heat due to being outside in the weather. Overall: decent efficiencies considering the underlying issues. Under the Optiwood project we recommended taking the buffer tank under cover and setting time delays on the boiler responding to the heat load to reduce boiler cycling.

Example Data Trends – showing frequent boiler cycling



Exhaust Flue Temperatures

Boiler Flow and Return Temperatures

2019-20 Changes and Improvements

With the changes recommended the estimated improvement in efficiency is 7% (from 66-73%)

Pilot Project 4 - Retail and greenhouse - 900kW	Wood Fuel Consumption (tonnes at 24% MC - kWh)	Wood Fuel Coverage (% of total heat demand)	Biomass Boiler Efficiency (%)	Costs of Wood Fuel	Tonnes CO_2 Emissions saved (cf with equivalent gas)
Heating Season 2018-19	216	100%	66%	£26,260	155
Heating Season 2019-20	305	100%	69%	£42,000	218
Gain or Loss	+89	-	+3%	+£15,740	+63
Estimated Additional Gain if Recommendations Carried out	Steady state or reduction	100%	+4% (73%)	-£1700	Static or small reduction

Footnote1: timer installed to reduce 'cycling' of boiler and reduced heat loss from buffer tank

Footnote2: Gas boilers on site not in operation

Footnote3: If improvements to boiler 'cycling' and buffer tank insulation and weather protection

Footnote4: Assuming steady state use of boiler but improved efficiencies

Key Lessons

- **Initial design – must size boiler correctly for the heat load**
- **Buffer tank controls are important and need to minimise heat losses**
- **Regular servicing and relationship with engineers important**
- **Better controls to reduce boiler cycling**