

University of Otago – wood energy works

The first-established and most research-intensive tertiary institution in New Zealand, the University of Otago, has always been focused on the future. So when their Property Services unit was upgrading its heating system, they knew renewable energy was the way to go.

Property Services – the ‘engine room’ of the University

The University of Otago’s Property Services division oversees the maintenance of campus buildings and grounds as well as new building construction. As the unit that keeps the University’s campuses functioning year round, Property Services’ energy use can be intensive. So when they were considering a heating upgrade, one of the key drivers was the ongoing cost of power. Renewable energy was the preferred option. But like any other organisation with limited budget, the final solution needed to make good business sense.

Wood energy – clean and economical

When Hans Pietsch joined Otago University as their Energy Manager in 2004, the Property Services building was mainly heated by electrical heaters and an LPG operated warm air ventilation system.

Hans had long been a fan of wood energy for its sustainability and clean burning properties. So when it came time to upgrade, his first recommendation was to install a 100 kW wood pellet boiler connected to low temperature hot water radiators.

The pellet boiler immediately made a noticeable difference in their energy costs by significantly reducing their reliance on electric heating. However the heating demands of the existing radiator system sometimes exceeded the capacity of the pellet boiler, which then meant having to fall back on electric heating.

Pellets and chips – the best of both worlds

To address this issue, Hans opted for a second, even more cost effective unit, a 100 kW Hargassner wood chip boiler (wood pellets tend to be more expensive than wood chips because of the processing involved to produce them), to be the main heat source. The increase in boiler heat capacity cleared the way for removal of the electric heaters and an LPG based system that heats the carpenters’ workshop.

Sourcing and set-up

The chip boiler was ordered directly from Hargassner in Austria as the model they wanted was not available through a New Zealand agent at that stage. However, fluctuations in the exchange rate between receiving the quote and placing the order meant that the final cost of the boiler was around 8% higher than budgeted.

Despite this setback, the installation went very smoothly including organisation of building consents for the changes needed to house the unit.

How it works

- When wood chip deliveries arrive, the transfer bin is wheeled over from a nearby storage area and connected to the base of the vertical lift auger. The chips are then tipped into the transfer bin, fed into the base of the lifting auger and then lifted up into the storage bin.
- Once the fuel is loaded in the storage bin, the rest of the process is fully automated – fuel is loaded into the boiler for combustion and the unit cleans and de-ashes itself.
- An external audit shows the boiler is working very efficiently, with very clean combustion. Any remaining residue is used as fertiliser on the University’s gardens.



The wood chip boiler operating the University’s Property Services division.

✓ Key features

- Capital expenditure \$96,700
- Unit sourced from Austria
- Installed auger system to avoid wood dust problems during fuel delivery
- Established supply contract to ensure chips are of sufficient quality

✓ Key benefits

- 25% reduction on annual power bill
- Estimated payback within 14 years
- 40% reduction in annual CO₂ emissions
- Renewable resource and carbon neutral
- Reliable and efficient operation with low particulate emissions

✓ Sector relevance

- Any, but especially suitable for:
- Educational institutions
 - Offices
 - Hospitals
 - Aged care

Lessons learned

Transferring chips from the truck to the storage bin in the usual way (using a truck-based blower) caused dust problems in nearby workshops and offices. This required a transfer bin and vertical lift auger system to be installed – at a cost that was not originally budgeted for. Careful consideration needs to be given to fuel loading systems when planning an installation.

It is important to ensure wood chips are of sufficient quality. Shortly after the chip boiler's installation, a supplier delivered hogged wood instead of wood chips – which was not identified immediately.

The hogged wood pieces were too large to fit through the auger and had to be cleared manually. Fortunately this did not damage the system, but the incident highlighted the need for staff training and effective checking procedures. Following the establishment of a supply contract, no further problems have been encountered as the chips meet the Wood Fuel Guidelines developed by the industry themselves.

The result – 'cheap as chips'

The wood chip boiler is expected to save Property Services around 25% on their previous year's power bill as well as significantly reduce carbon dioxide emissions. Although it is early days, they are on track to achieve this goal, despite the power demands of an extra air handler (the unit which controls air temperature, humidity and quality) that was not factored into their original calculations. Obviously as winter sets in heating demand will increase – but at this stage, the new heating system looks promising.

Future-focused

Interest in this technology is increasing rapidly in New Zealand, particularly now that people can see it works. Hans plans to use wood energy again in the near future. In fact he has plans for a 600 kW wood chip boiler to replace existing diesel boilers providing heat for eight major buildings on campus.



Key personnel

Hans Pietsch (University of Otago Energy Manager)
hans.pietsch@otago.ac.nz



University of Otago's – perspective

Hans Pietsch – Energy Manager:

“Alternatives to fossil fuels are needed. Although the upfront cost of wood energy systems are more expensive than fossil-fuel or electricity-based equivalents, the price for wood fuel is very competitive.

“Wood energy works – there's nothing special about our situation – you could replicate this in any organisation of similar size.

“The simplicity of the chip boiler is amazing... there's very little that can go wrong – but it's still got all the features you expect like self-cleaning and automatic de-ashing.

“Renewable energy is not just a 'green' approach – it's quite simply the right way to go. We won't see payback in the short term – in fact it'll be more than ten years before this pays for itself. But as prices of gas and electricity rise, wood increasingly will make sense.

“I would say to any organisation considering wood energy – don't be scared, this technology is not new – it's been in use for nearly 20 years overseas.”

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For more information contact The Energy Efficiency and Conservation Authority:

EECA HEAD OFFICE: PO Box 388, Wellington, (04) 470 2200

EECA AUCKLAND: PO Box 37444, Parnell, Auckland, (09) 377 5328

EECA CHRISTCHURCH: PO Box 13983, Christchurch, (03) 353 9280

www.eecabusiness.govt.nz