



## High school heats with clean, green wood energy

### ✓ Key features

- Two 640 kW wood-fired boilers installed to replace old coal boilers

### ✓ Key benefits

- 14% more efficient than coal
- Two hours less maintenance per day
- CO<sub>2</sub> emissions reduced by 216 tonnes per year
- Five times less particulate pollution
- Payback of choosing wood over diesel: less than three years

Cashmere High School switched from coal to renewable wood energy to heat its 85-classroom site. It's finding it more efficient, easier to run, and carbon-neutral – with no more dirty soot on the school grounds.

When Cashmere High School was faced with replacing its antique coal-fired boilers, future-proofing the school's heat supply was one of the key concerns.

The school, with more than 1700 students, occupies a large site at the foot of Christchurch's Port Hills. Its coal-fired boilers had been heating the school since 1977, with hot water pumped through underground piping to radiators.

#### **Status quo not an option**

In 2008 the school's discharge consent for coal boilers was due to expire and couldn't be renewed due to new air quality regulations. Because of Christchurch's low-lying geography and inversion layer, the city suffers from smog – particularly in winter months. New standards enforced by regional council Environment Canterbury,

effectively rule out coal as a fuel for schools.

This co-incided with the school's boilers reaching the end of their lives – one had started leaking. New boilers, as well as a new fuel source, had to be found.

Although the Ministry of Education meets all schools' energy costs, Cashmere High support services manager Roger O'Regan says cost was an important consideration.

"There isn't a financial incentive as such for schools to reduce their energy bills, but we did have a responsibility to be cost effective. What was important was not only 'how much will this cost us today?' but 'what will this look like in ten years' time?'" he says.

This entailed looking not only at the cost of installation and fuel, but also running and maintenance costs.



Two 640 kW wood-fired boilers.

In addition, there was a philosophical drive within the school community to be as environmentally friendly as practical.

“We do a lot here in terms of recycling, and there was a feeling that here was an opportunity to lower our carbon footprint. It felt like the honest thing to do,” says Mr O’Regan.

#### Wood vs. other fuels

A move away from boilers altogether to electricity was briefly looked at as an option - but the school’s land-locked site and the high cost of new infrastructure ruled that out.

“We’re unashamedly fans of low pressure hot water systems for heating,” explains Mr O’Regan. “Effectively the brief was to find the best alternative way to heat our water so that we could continue to use our good pumping and dispersal system, and the radiators in place throughout the school.”

Consultants Enercon produced a feasibility study that compared wood fired-boilers (using both pellet and wood chips) with LPG or diesel.

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The school now has a five-year contract with Solid Energy for the supply of pellets.

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The study recommended two new wood-fired boilers to replace the old coal boilers. Though a diesel boiler was the cheapest to install, the cost of the fuel (estimated at \$41,000 annually compared to \$33,000 for wood pellets) ruled diesel out. The volatility of fossil fuel prices – not to mention the high CO<sub>2</sub> output and possibility of a future carbon tax – cemented diesel and LPG as unpalatable options, says Mr O’Regan.

The estimated payback period for selecting wood pellet boilers over diesel, is less than three years.

#### Moving to wood pellets

In May 2008 Cashmere High School installed two new 640 kW wood-fired boilers, capable of running on chips or pellets. The installation cost around \$290,000 – less than budgeted – and the school secured a \$50,000 capital grant through EECAs Renewable Heating for Schools program.

The feasibility study had recommended using wood chips for fuel, as chips were estimated at roughly a third of the cost of wood pellets, and this was the school’s preferred option. But because there was no data available on the performance of chips, and the resource consent process was likely to be difficult, they opted instead for pellets, “which already had a track record,” says Mr O’Regan.

The school now has a five-year contract with Solid Energy for the supply of pellets. Within this contract, pricing of wood pellets will only increase in line with the producer’s price index. This pricing structure will help insulate the school from the current volatility seen in energy prices. When the five-year contract expires, Cashmere High School may consider shifting to the cheaper wood chips. Mr O’Regan is confident that the growing demand for renewable wood energy will see the necessary data for chips become available, “but that will depend on how the market formulates.”

## Cleaner and more efficient

Cashmere High is just entering its second heating season with pellet-fired boilers, and Mr O'Regan says the difference is palpable.

"Looking at our music and hall area, there used to be soot and ash in the gutters. Now we just have clean, clean emissions and that's it," he says.

The new boilers produce around five times less particulate emissions than a typical school coal boiler. Not only has the new system significantly reduced particulate pollution, but it is also carbon neutral because wood is a renewable energy source. This means carbon emissions have reduced by 216 tonnes per year.

The wood-fired system is also 14% more efficient. Once the old coal boilers were lit they ran 24 hours a day during the winter months, either kindling or on full operation. Now the boilers ignite at 4.30am, bring the water to the 75°C target by 7.30am, and switch off at 10.30am. The hot water continues to be pumped through the school until mid afternoon, when it has cooled to around 50°C.

"While the boilers are operating, the hot water gets pumped out at 75°C and when it comes back to us it's still around 68°C – that's all the heat we're losing," says Mr O'Regan.

The new control system also means he can re-programme the heating times from his desktop computer. And importantly, the job of cleaning out the coal boilers, which used to take the school's caretaker two hours a day, has now disappeared.

During 2008 the school's heating system consumed slightly more than 100 tonnes of wood pellets, with a total operating cost of \$33,660. Although it is more expensive than coal, Mr O'Regan expects the cost differential to reduce over time as it becomes possible to procure cheaper wood products and as coal – which he believes is under-valued – increases in price.

"Some things aren't simple dollars and cents. When you take into account the value of the carbon reduction and cleaner environment, I'd say it's virtually fiscally neutral."





The new boilers produce five times less particulate emissions than the old coal-fire boilers.

### A popular choice

Since fitting the boilers, Mr O'Regan says he's become aware of four or five other schools in the Canterbury region who have independently pursued a switch to wood energy. "This could work equally well in other situations where a number of buildings are spread over a large site, particularly in areas with air quality issues," he says.

The school has hosted numerous visits from other organisations wanting to inspect the new system and see it in action, including senior managers from a hospital.

"We had one group who came to see the operation and just stood on the steps and laughed. They said, 'that's not a boiler room'. It's clean and white, and quiet – there's no dirt and dust and noise like we had when we were running coal. It's a much healthier environment now," he says.

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