

Mairehau High School – wood for wellbeing

At Mairehau High School, wellbeing comes first – and that includes providing a healthy and comfortable environment. Now, with clean efficient wood energy delivering heat where it is needed, Mairehau students can learn at their best all year round.

Time for a change

Mairehau High School in North Christchurch has weathered many cold winters in its 50 year history. But by 2008, their heating just was not up to the job. The school had been relying on two coal boilers – one of which was ancient, run down to the point where it was belching smoky emissions. The other, more modern boiler was adequate but the controls were not working properly.

The heat distribution system relied on underground pipes that were regularly exposed to ground water when it rained. As a result the pipe insulation had rotted away which meant much of the heat generated was being wasted.

All this meant heat was not reaching some of the classrooms, making them almost unusable – and certainly uncomfortable. Meanwhile local clean air legislation had been introduced which meant consents for burning coal were being phased out because of the high particulate emissions produced.

It was time for a change. And with 500 students and 75 staff to look after, Mairehau High School needed to do it once and do it right – by choosing a future-proof system that would last for decades.

A 21st century solution

The first step was to find an alternative to coal. The school commissioned a feasibility study which looked at wood pellets, LPG, electricity, reclaimed vegetable oil and diesel. After considering the options, the school chose wood pellets because it looked like the most cost-effective and convenient long-term solution.

The school decided to remove the old boiler and convert the newer boiler to run on wood chips or pellets. At the same time, the hot water distribution system underwent a major upgrade to reduce the significant heat losses that were occurring. As well as new insulated pipes, a sophisticated electronic Building Management System (BMS) was installed to allow heating for individual school blocks to be controlled independently.

Total control

The BMS controls the amount of fuel fed into the boiler in response to local heating requirements for each block. These vary in relation to how many people are using the space at any one time, outside air temperature, insulation and building construction.

The boiler conversion included a fire suppression system and alarm system to stop fire returning up the feed system. The BMS is computerised and can be controlled and monitored remotely (for example, from the home of the Property Manager).

Learning from experience

The converted boiler was fitted with an automatic ignition system to allow it to be turned off at night, weekends and school holidays. This feature is designed to reduce energy use and maintenance. It also allows the boiler to be fired at any time of year. Before, if spring was unusually cold, students and staff had to put up with no heating.

However the school initially experienced problems with the ignition system as it regularly failed to start up the boiler. It was eventually replaced and no further problems have been experienced.



Mairehau High School.

✓ Key features

- Total capital outlay for project: \$422,700 for boiler conversion, new insulated piping, and fully computerised BMS
- 30+ year lifespan
- Potential to add second wood boiler in future if school expands
- BMS allows each school block to be controlled independently – and monitored offsite
- Converted boiler can run on wood chips or pellets

✓ Key benefits

- 10% reduction in energy use
- Reduction of 127 tonnes annual CO₂ emissions
- Low particulate emissions
- 90% reduction in ash waste
- 75% reduction in maintenance
- Renewable resource and carbon neutral.

✓ Sector

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



Geoff Parkin, Property Manager, checks the converted boiler.

Heating demand can be challenging to predict – particularly when usage data is based on an inadequate system being used in the past. Mairehau's heating demand has turned out to be significantly greater than estimated in the initial feasibility study – and this has led to a higher fuel cost than budgeted for.

The results – clean, efficient heat

The school originally planned to replace the older boiler with a new 550 kW wood-fired boiler. However the combined effect of the converted boiler (which was rated at 730 kW after the conversion) and new distribution system was so efficient, that it was decided to hold off purchasing a new boiler unless heating demands increased significantly.

The school reports that the system now works much more efficiently delivering sustained heat exactly where it is needed. Fuel consumption has reduced by 10% due to better heat control and insulation.

Mairehau High School Property Manager Geoff Parkin estimates at least two hours less per day is spent maintaining the wood boilers. There is no longer the health risk and inconvenience of removing six bins of toxic coal residue every week. Any ash that the converted boiler produces is organic so can be mixed in with compost and used on the school's vegetable garden.

Chips – a future option

Mairehau High School recognises that it needs to show environmental leadership and is still keen on wood, despite using more wood pellets than originally predicted.

Although Mairehau's converted boiler runs on wood chips or pellets, the school chose to use pellets as they were more readily available than chips at that stage – as well as reliable, and easy to handle and store. The school is planning to investigate using wood chips in the future as storage is not an issue and there are now several quality wood chip suppliers in Christchurch.

At current rates, chips are selling at around 60% of the cost of pellets, so could offer Mairehau all the benefits of wood energy while substantially reducing its ongoing fuel costs.

Key personnel

Geoff Parkin (Mairehau High School Property Manager) parking@mairehau.school.nz

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Mairehau High School's perspective

Geoff Parkin, Property Manager:

"I'd recommend wood to anybody – it's so much cleaner and easier to maintain. We compost two bins of wood ash every term instead of having to get rid of six bins of coal ash a week. It's less dusty and healthier to work with – and we don't need to get in there with a wire brush every week.

"Because the old system was so inefficient and we were new to wood fuel, it was hard to budget for what the school was likely to use. So we went through a few more pellets than we predicted but now we know what to expect. And, we'll certainly look into wood chips at some stage in the future.

"Under the old system, you didn't have a choice, whether it was hot or cold the coal boiler threw out the same amount of heat. We have so much more control now – a lot less heat is wasted and everyone is more comfortable all year round."



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