



ADAPTING TO A CHANGING CLIMATE: CASE STUDY 17

FROM COAL TO CARBON NEUTRAL

Edgecumbe College school boiler conversion

EDGECUMBE COLLEGE

- A rural co-educational secondary school catering for around 340 Year 9 to 13 students.
- Located in the eastern Bay of Plenty township of Edgecumbe and draws its students from twelve widely-spread contributing schools.
- Over the past few years the school has made a number of positive changes toward achieving sustainability.
- Was using some 30–40 tonnes of coal for heating a year in a coal-fired boiler.



THE BOILER CONVERSION

- Converting a coal-fired boiler system to a wood pellet-fuelled boiler system, which uses a renewable fuel source that is cleaner and more efficient.
- Funded through the Energy Efficiency and Conservation Authority (EECA) Wood Energy Grant Scheme.
- By utilising existing infrastructure, the school has achieved superior heating and a significant reduction in emissions.
- The environmentally-friendly, carbon neutral option has made a significant, positive impact on staff, students and the community.



Edgecumbe College is typical of most New Zealand schools. Somewhere tucked away behind the rest of the classroom and administrative buildings lies a coal-fired boiler that burns tonnes of coal annually in order to heat the school.

What makes Edgecumbe College unique is that in 2008 the school took the opportunity to reduce its carbon footprint by converting the coal-fired boiler into one that runs on wood pellets, demonstrating to both students and the community, the viability of making environmentally friendly energy choices.

HOW THE BOILER SYSTEM WORKS

Boilers use heat exchange surfaces to heat water or to make steam if required for industrial processes. Hot water is especially effective for heating a space using under-floor, radiant, ceiling and forced air central heating. Boilers are often found in schools and businesses.

Traditionally, boilers use coal, gas or diesel as a fuel source. Today, the carbon-friendly alternatives are wood pellets or wood chips used as fuel in specifically designed boilers.

For schools that still have the original heat plant setup of a boiler and hot water heating network, these boilers can be converted or replaced to run on wood chips or wood pellets.

Boiler conversions involve modifying the combustion characteristics, fuel handling and storage facilities of existing boilers but continuing to use the hot water heating network.

WHY THE CHANGE?

Edgecumbe College Finance and Property Officer Gloria Boulton says the main concerns with the coal boiler was the impact it had on the air quality around the school, and on the health of the school's caretaker.

"Local residents were not happy with the smell, smoke and dust that settled over them when the boiler was running. Staff were also unhappy with the impact the coal had on the air."

But it was the school's caretaker Bob Hawthorne who bore the brunt of the impact, spending most days shovelling coal and dealing with the ash and clinker – the unburnable minerals in coal that are heated to melting point.

He says: "We would go through around 30–40 tonne of coal a year; that's a lot of dust and residue to have to deal with. Not only did I often have to climb up into the coal pit to help keep the fuel flowing, I also had to remove large quantities of ash, maybe two to three bucket loads a day, all of which went to landfill."

Key points

1. The benefit of changing to a biomass-based fuel, such as wood chip or wood pellets, rather than fossil fuels like coal, is that the emissions are reduced and the fuel is considered carbon neutral.
2. The use of a wood pellet boiler over a coal-fired boiler means a reduction in CO₂ (carbon dioxide), CO (carbon monoxide) and SO₂ (sulphur dioxide). The carbon emissions saved through not burning coal amount to around 60 tonnes of CO₂-equivalent per year.
3. The new wood pellet boiler is more environmentally friendly and provides the school with a carbon neutral heating system that generates fewer emissions, has low ash output and means no more complaints from the community about air pollution.

“Plus, there is a lot of upkeep required on a coal boiler because there are a lot of residues left when coal gets burnt and this builds up and reduces the boiler’s efficiency.”

A POSITIVE ENVIRONMENTAL AND SOCIAL OUTCOME

The benefit of changing to a biomass-based fuel, such as wood chip or wood pellets, rather than fossil fuels like coal, is that the emissions are reduced and the fuel is considered carbon neutral.

The design of pellet stoves ensures almost complete combustion and when combined with the cleanliness of the fuel, results in the cleanest burn and lowest ash of any solid fuel. What little ash is generated from the boiler is used as a soil conditioner in the gardens.

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By converting from coal to wood pellets, the volume of particles in the air can also be halved and minimal emissions mean there is a very low impact on air quality. Today, Bob has cheerfully dispensed with the mask and gloves that were previously needed to handle the

coal and says the conversion has had a significant impact on his working day.

“With no more need to move coal around, there is no more coal dust, no need for masks and no damaged clothing. The uniform size and weight of the pellets, and the low moisture content, mean they are less likely to get stuck or clogged as they flow through the boiler system.

“With the new system, there is maybe one shovelful of ash and minimal upkeep needed. The issue of clinker build-up has also disappeared.”

Into the future, the College hopes to be able to work with neighbouring Edgecumbe Primary School to support them in achieving a similar boiler conversion and reduce emissions over Edgecumbe even further.

The school is also looking at other options for the disposal of the ash which can act as a soil conditioner.

ABOUT WOOD PELLETS

- Clean and efficient burning, convenient and cost effective.
- Lowest ash and emissions output of any solid fuel – ash is reduced to 10 percent of that produced by coal-fired boilers.
- Ease of handling.
- Fully automated burning systems.
- Recommended for applications where there are space constraints.
- A popular and environmentally friendly decision for schools.



The wood pellet industry is relatively new to New Zealand, but well established in Europe and North America. Today more than 1.2 million pellet stoves are in use throughout North America.

Wood pellets are a clean-burning, convenient and cost-effective form of fuel. The uniform size and low moisture content of wood pellets makes them a very effective and compact fuel which allows for cost-efficient handling, transportation and storage.

Wood pellets should be burned in specially designed stoves and boilers. The design of pellet stoves ensures almost complete combustion, resulting in the cleanest burn and lowest ash of any solid fuel. Minimal emissions mean there is a very low impact on air quality.

**THIS IS ONE IN A SERIES OF CASE STUDIES CALLED
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FOR MORE INFORMATION

- For more information on boiler conversions or bioenergy, visit the Bioenergy Knowledge Centre www.bkc.co.nz
- You can also visit the Energy Efficiency and Conservation Authority website www.eeca.govt.nz
- For more information on Edgecumbe College, visit www.edgecumbecollege.school.nz
- If you have any questions about boiler conversions or bioenergy, call the Bioenergy Knowledge Centre Freephone on 0800 246 363