September 2025

McCain Timaru case study

Conversion of coal boiler to biomass boiler for food product manufacturing

EECA
TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY

aurecon

Executive summary

McCain's Timaru site produces fries from raw potatoes and relies on high demand for process heat. Until recently, this was supplied by a lignite coal-fired boiler. Between 2021 and 2022, the company converted its 14 MWth boiler to operate on biomass in a traveling grate furnace, with operations commencing in June 2022. The project focused on improving efficiency, fuel performance, and long-term resilience while reducing reliance on coal.

Since the conversion, the boiler has delivered clear energy efficiency gains. The boiler's thermal efficiency on biomass is higher than on coal, improving overall system performance. Maintenance costs have fallen, ash production is lower, and wastewater quality has improved. These benefits have increased reliability and reduced running costs. The project also highlighted the value of paying for fuel on an energy basis ($/GJ) rather than by mass ($/tonne), ensuring consistent quality and fair value.

A critical factor in success was McCain's decision to procure the conversion and fuel handling system through a single turnkey contract with Lyttleton Engineering. This avoided interface risks between multiple contractors and ensured fuel supply was tightly aligned with system performance. Lyttleton Engineering was also closely involved in fuel procurement, crucial to meeting efficiency and reliability targets.

The project was not without challenges. Early issues included incomplete combustion in the woodchip feed system, requiring airflow and feeder adjustments, and blockages caused by oversized biomass pieces. These reinforced that biomass handling and feedstock quality are critical to sustaining productivity and efficiency.

Alongside operational improvements, the project has reduced coal use and lowered carbon costs, avoiding an estimated 30,000 tonnes of CO_2 emissions annually. The conversion earned McCain New Zealand a 2022 Sustainability Award from the Sustainable Business Network, recognising both the efficiency improvements and the broader sustainability outcomes.

The McCains boiler project demonstrates that converting existing coal boilers to biomass can deliver significant efficiency and operational gains, with reduced emissions as an added benefit. This case study was commissioned by EECA to capture the lessons from McCain's first biomass conversion and provide insight for other food producers seeking to improve efficiency and resilience in their process heat systems.

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1 Project Overview

All information in this case study was obtained from the resources listed in this Chapter.

1.1 McCain Foods

McCain Foods Limited is a Canadian company that produces frozen food for more than 60 years. It is the largest manufacturer of frozen food accounting for almost one third of global French fries demand. McCain NZ has two New Zealand sites – Timaru and Hastings.

The McCain Timaru site produces fries from raw potatoes in several steps. Process heating and cooling are both required, including for pre-heating, blanching, drying, frying, and freezing the potatoes. In the late 2000s, McCain's Global set the goal for the New Zealand sites to completely remove coal.

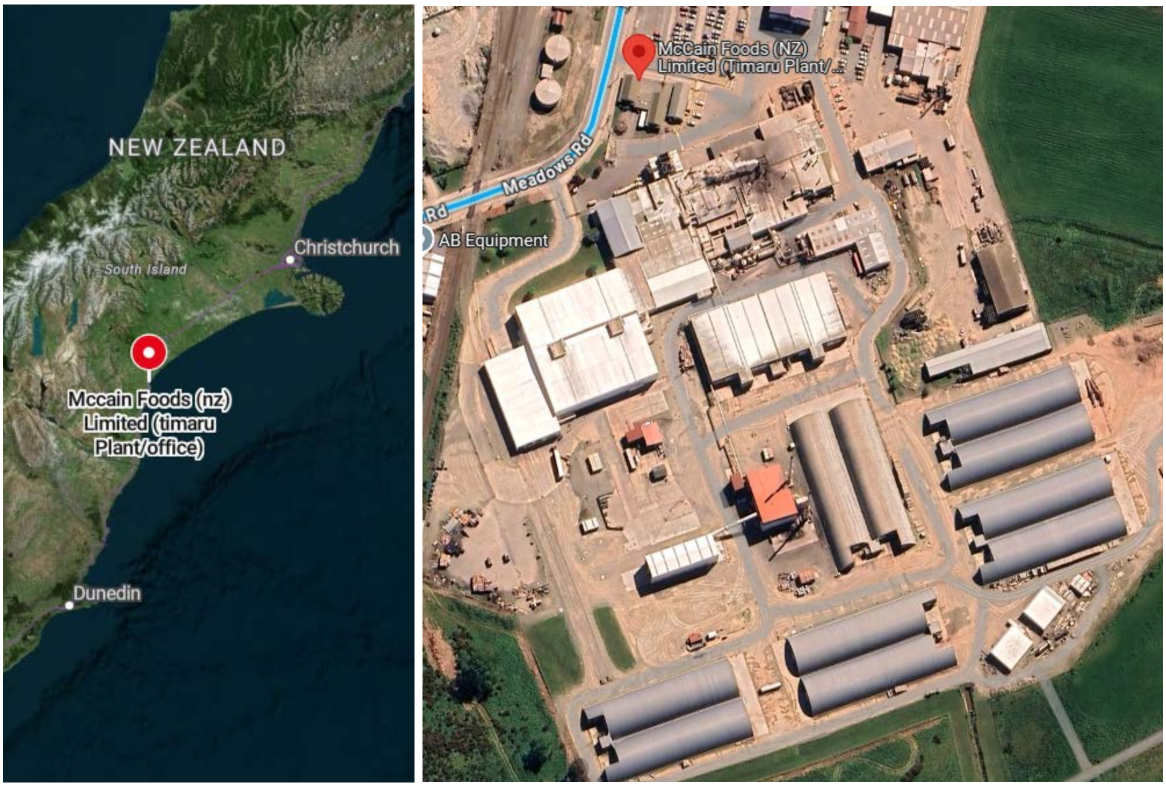

Figure 1: Location of McCain Timaru site

1.2 Project Background

Over 2021 to 2022, McCains Timaru converted their lignite coal fired boiler to fire biomass. The project, named as 'McCain Foods Timaru boiler conversion', converted the 14 MWth coal-fired boiler to biomass. The project was operation in June 2022. Additionally, McCain have completed a number of energy reduction projects, which includes Mechanical Vapour Recompression (MVR) in the process plant, that has decreased steam consumption to 16 tonnes per hour. McCain NZ won a New Zealand Sustainability Award in 2022 from the Sustainable Business Network.

1.3 Resources & Stakeholders

All information in this report has been obtained from the resources listed in this section.

Table 1: Resources & Stakeholders

Who	Location	Role & Expertise	Useful Links & Contacts
McCain	Canada Timaru, New Zealand	Frozen Food Producer	https://www.mccain.com/
Waikato University	Hamilton, New Zealand	Engineering adviser	https://www.waikato.ac.nz/
Lyttleton Engineering	Lyttleton, New Zealand	Boiler supplier and installer	https://lytteng.co.nz/
Living Energy	Auckland, New Zealand	Biomass handling and feed systems	https://www.bioenergy.org.nz/living-energy
Timaru Construction Ltd	Timaru, New Zealand	Civil works and building	https://timaruconstruction.co.nz/
Silva Studio	Timaru, New Zealand	Architect for the fuel store	https://silvastudio.nz/
Chapman Consulting Engineers	Timaru, New Zealand	Structural engineering for the fuel store	https://www.chapmanengineers.co.nz/
Professional Electrics Ltd	Canterbury, New Zealand	Electrical Technician	https://www.prolec.co.nz/
Pioneer Energy	New Zealand	Biomass fuel supplier	https://www.pioneerenergy.co.nz/
Energy Efficiency and Conservation Authority (EECA)	Wellington, New Zealand	Leadership, support and co-funding	Co-funding and Support | EECA Biomass boilers for industrial process heat | EECA McCain shares its emissions reduction journey | EECA EECAEnquiries@eeca.govt.nz

1.4 Roadmap

A roadmap for showing sustainability and energy security initiatives, is shown in the figure below.

Figure 2: Energy Roadmap (EECA)

2 Concept & Feasibility Design

McCain employed a dedicated Energy Engineer under the EECA Energy Graduate programme to identify and implement energy saving projects at the Timaru site.

McCain completed an Energy Transition Accelerator (ETA) with Waikato University. The ETA programme is administered by the Energy Efficiency and Conservation Authority (EECA), it is a study that maps a pathway to decarbonise industrial sites. This study showed that the existing coal boilers could be converted to wood chips.

McCain have been working with Lyttleton Engineering since the 1990s. Lyttleton Engineering installed the two coal boilers on the Timaru site, Boiler 1 was installed in 2002, and Boiler 2 was installed in 2015. Boiler 2 was installed due to too much downtime with Boiler 1. Boiler 2 was designed for a lignite coal fuel, which is simpler to convert to wood chip, as explained in detail later. Boiler 1 was designed for a sub-bituminous coal which can still be converted but would have a reduced capacity.

McCain used resources from the Bioenergy Association NZ as part of their research on the biomass supply chain.

3 Detailed Design & Procurement

3.1 Biomass Supply Chain

McCain completed a competitive tender for the contract to supply biomass fuel. The tender evaluation criteria valued suppliers who McCain could work with as 'business partners'. Lyttleton Engineering were heavily involved with the biomass fuel procurement because this was crucial to ensure Lyttleton Engineering met the performance criteria on their engagement with McCains.

Pioneer Energy won the contract to supply wood chip, supplying approximately 28,000 tonnes per annum. The fuel is supplied to the fuel specification P45A3M35, which has the following characteristics:

- Clean wood chip or hogged timber – pine or similar
- Moisture Content: 25-35%
- Ash Content: ≤ 3%
- Size Distribution: P45A or smaller if chipped, P45 if hogged
- Gross calorific value (AR): 15.4 MJ/kg
- McCain spot test moisture content onsite

3.2 Biomass Handling & Feed System

The Block Flow Diagram (BFD) below shows the main components of the biomass handling and feed system, which is made up of the following features:

- Trucks reverse into a semi-enclosed biomass reception area and tip biomass into two storage bays
  - Each bay is 42 m long and 6 m wide, constructed of tilt slab panels 5.5 m high supported by structural steel portal frames with colour steel cladding to a height of 11 m, which allows clearance for the truck to tip fuel.
  - Together the bays make up 1000 m^3 of biomass, which is three days of boiler operation on average. This volume covers weekend operation and any small potential interruptions in the supply chain, which is likely to happen with flooding
  - A trucks and trailer load can transport 120 m^3 of wood chip
- A large rake, which is attached to a trolley, rakes biomass from the storage area up a ramp to a mesh conveyor which feeds the boiler hopper:
  - No front loader is needed
  - The storage bays and dosing conveyor system make up the Toploader which was supplied by Living Energy
- The wood chip is moved from the storage area to the boiler hopper using a 40-50 m long overhead extract conveyor system, which includes the following features:
  - Walkway down one side to allow for easy maintenance
  - A maximum slope of 20°
  - Hinged coloursteel covering the conveyor belt to keep fuel dry but still allowing for maintenance
  - Plastic troughing and return idlers for lower maintenance
  - Belt scraper and distribution chutes at the top of the hopper
  - Three support towers and 21m truss to allow 6m clearance for truck movements under the conveyor
  - The conveyor is kept as empty as possible to reduce the risk of fire spreading between the fuel store and boiler house. In the event of a fire, the conveyor continues running until it is empty.
- The boiler hopper feeds the fuel feeder

The system operates in a cycle of three modes:

- Filling – the storage area is filled with tipping trucks
- Stacking – the biomass is raked to the extract conveyor
- Extracting – the product is discharged onto a conveying system which fills the boiler hopper

The coal handling system was kept in place, so if there was an issue with the biomass supply chain, the boiler could be fired on coal, with some modification.

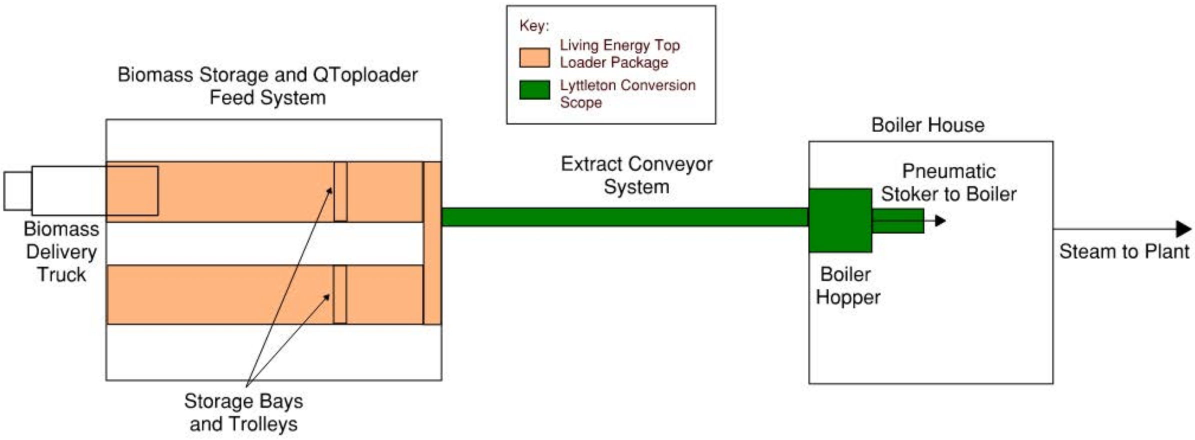

Figure 3: Indicative Layout of Biomass Handling & Feed System

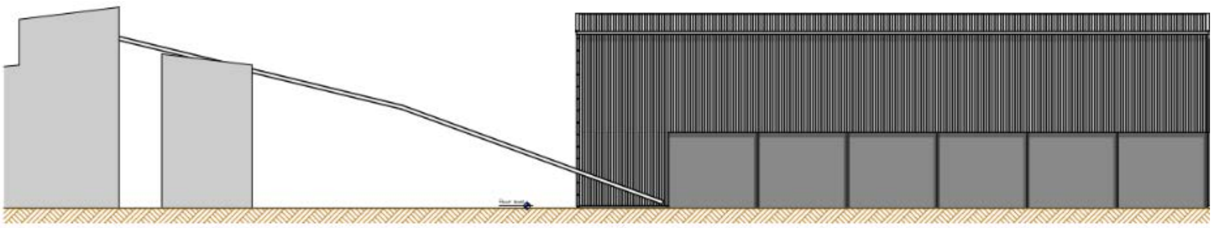

Figure 4: Elevation Drawing of Biomass Handling & Feed System

3.3 Boiler Design

Boiler 2 was installed by Lyttleton Engineering in 2015 to fire on a lignite coal. The boiler was designed and fabricated at the Lyttleton Engineering workshop in Lyttleton, under license from Maxitherm. Key features include:

- Maxitherm water tube boiler
- Louver travelling grate
- Large balanced furnace
- Refractory lines
- Saturated steam

Figure 5: Photo of Boiler (Lyttleton Engineering)

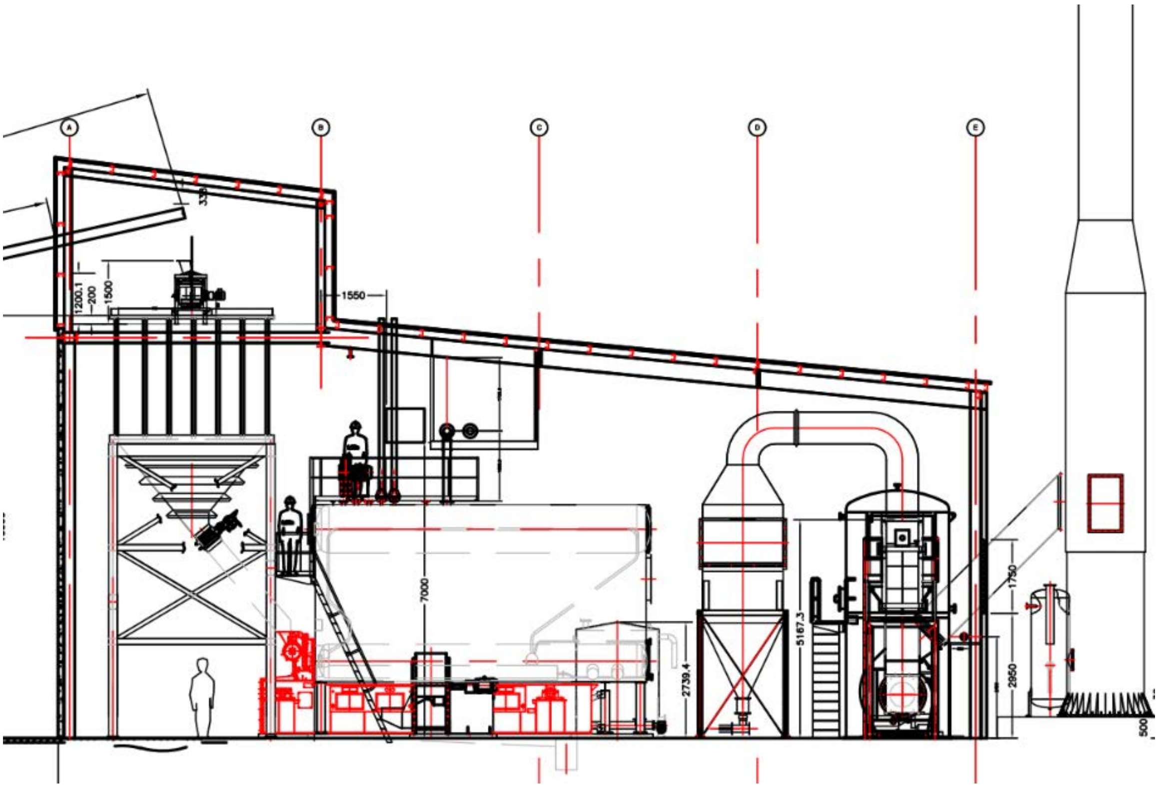

Figure 6: Boiler Schematic (Lyttleton Engineering)

3.3.1 Feeder Modification

To allow the boiler to use wood chips effectively, the feeder into the boiler itself was modified. The original, mechanical feeder system designed for lignite, was replaced with new pneumatic feeders for biomass design by Lyttleton Engineering. The feeders have burn back protection and modulating screw feeds to regulate fuel delivery to the pneumatic spreaders.

Lyttleton Engineering design and build the pneumatic feeders and have installed them in many coal boilers across the South Island of New Zealand, including a hospital and a meat processing plant.

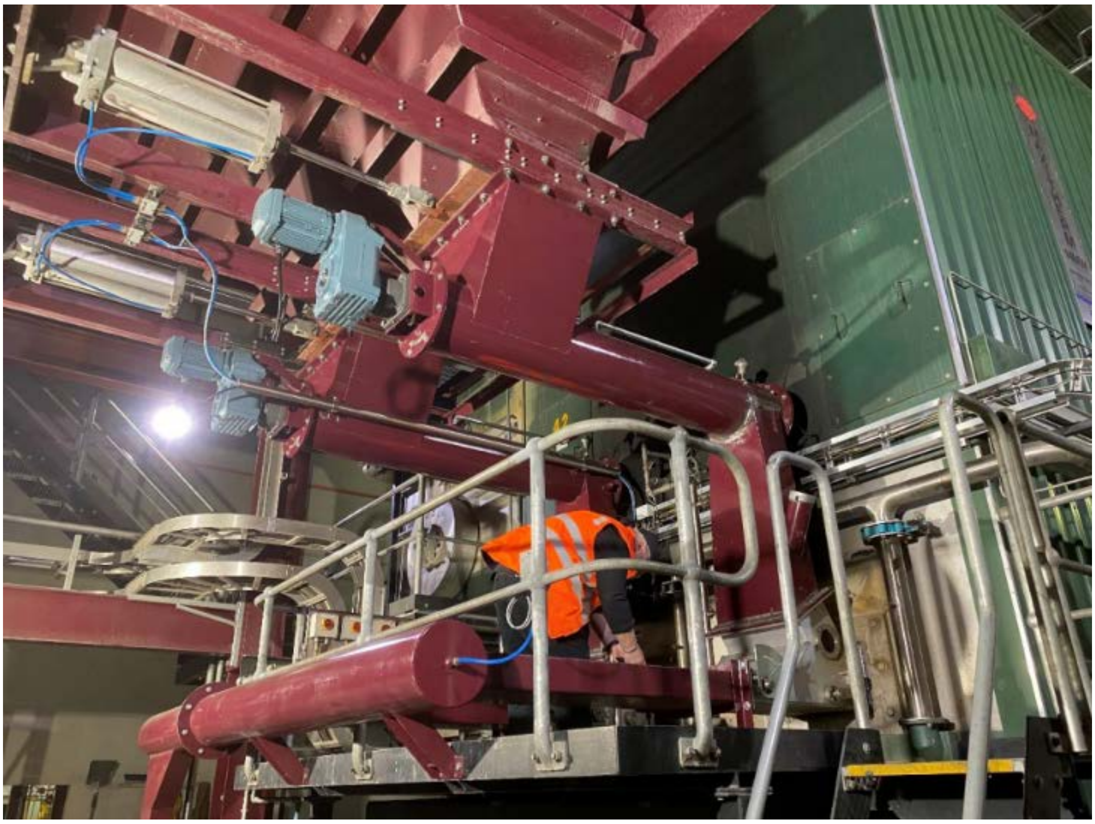

Figure 7: Biomass Pneumatic Feeder (Lyttleton Engineering)

3.3.2 Travelling Grate Furnace

The travelling grate allows for optimal distribution of biomass throughout the combustion system to ensure complete burnout, minimal emissions and maximum efficiency. As the fuel moves across the furnace it goes through the following stages of combustion, listed below and illustrated in the following figure:

- Pre-drying to remove all moisture prior to pyrolysis and combustion
- Pyrolysis, where the gaseous volatiles are released from the fuel
- Volatile combustion, where the volatiles are burned in the gaseous phase
- Char burnout where the larger organic polymer structure breaks down and oxidise, such as hemi-cellulose, cellulose and lignin
- Bottom ash falls into a conveyor which is fed into a dedicated skip bin
- The furnace temperature peaks at 876°C at 100% Maximum Continuous Rating (MCR)

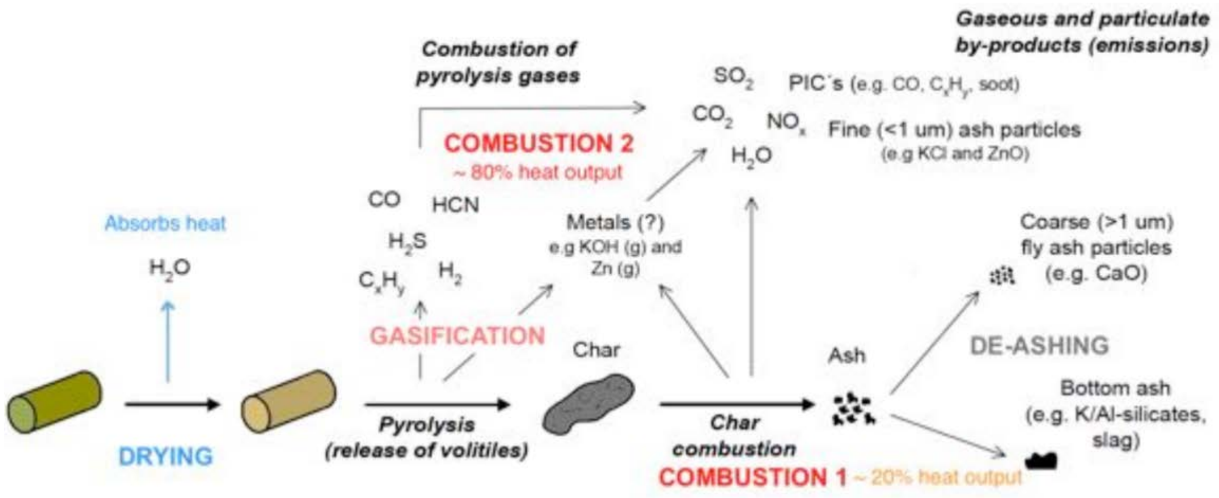

Figure 8: Stages of Combustion (Polytechnik)

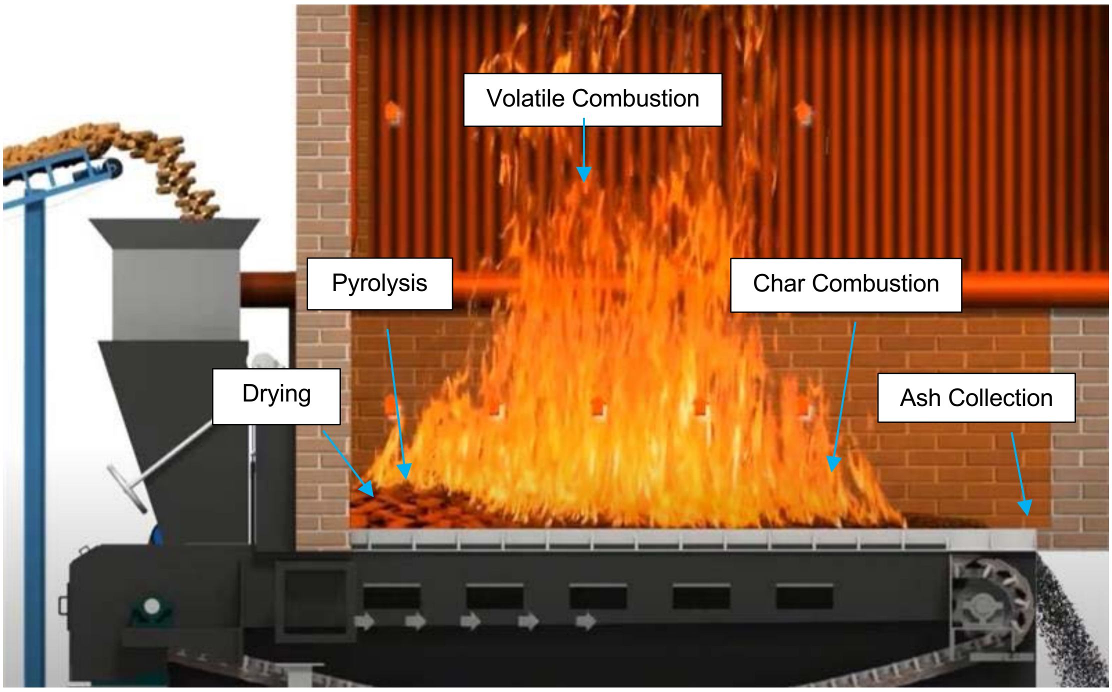

Figure 9: Travelling Grate Boiler

3.3.1 Combustion Air

The coal boiler had most of the combustion air fed through under the grate, for char combustion, with some over fire air for volatile combustion. Energy from biomass combustion is from approx. 80% volatile combustion and 20% char combustion. This is the opposite for most coal where the majority of heat is from char combustion. Additional over fire air nozzles were installed to adjust the air flow accordingly.

3.3.2 Air-to-fuel Ratio

The boiler is operated with excess air overall, which is a Lambda just over 1. The air-to-fuel ratio varies across the combustion zones, it is lambda <1 in the pyrolysis and >1 in the volatile and char combustion. An overall Lambda just over 1 provides the optimum combustion environment which achieves the highest combustion efficiency and minimises emissions of hydrocarbons, carbon monoxide and particulates, as is illustrated in the figure below.

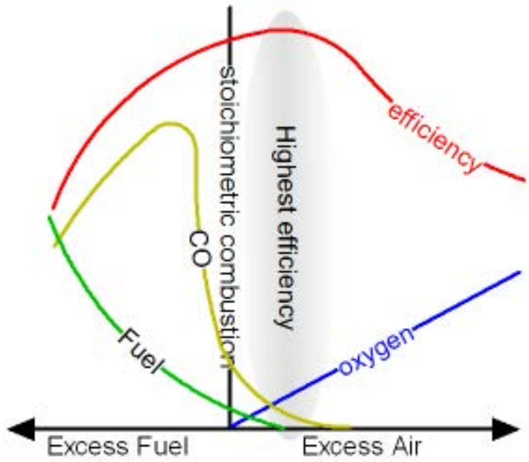

Figure 10: Optimum Air-to-Fuel Ratio

3.3.3 Flue Gas Temperature

Thermal efficiency of boilers is largely related to the flue gas exhaust temperature. Generally, the lower the flue gas temperature the high the efficiency and vice versa. Flue gas is used to pre-heat the make-up water and flue gas exit temperatures was designed to be approximately 150°C.

3.3.4 Heat Exchange System

The boiler is a water tube boiler, which will have water walls and banks of water tubes over the furnace, to capture the heat of combustion.

3.3.5 Particulate Controls & Flue Stack

Flue gasses pass through a multi-cyclone grit arrestor and then a baghouse to capture fly ash. The baghouse is made up of fabric filters, which are air pulsed periodically with compressed air to dislodge particulate build up which drops out into the ash collection system.

Figure 11: Ash Collection

4 Installation, Commissioning & Handover

4.1 Biomass Supply Chain

McCain pay for the biomass on an energy basis ($/GJ), not a mass basis ($/tonne). Payment on an energy basis ensures the Client is obtaining fair value for the fuel, as they are not paying for fuel that does not meet the required specifications/standards, such as fuel with a high moisture content and lower energy content than required. McCain check the energy content by spot testing the moisture content on delivered biomass fuel, particularly if the fuel does not appear to meet specification. The moisture is measured via blue bucket testing, which is an industry standard testing procedure. If the fuel moisture content exceeds certain threshold three times, then a contractually agreed penalty applies. This fuel payment method was investigated for the previous coal supply contract – coal was purchased per tonne for a predefined calorific value per tonne, however McCain found that the average calorific value per tonne was below the agreed contract value.

Note that the frequency of fuel delivery trucks has increased three times since switching to biomass, but the distance of delivery is much shorter. Biomass is delivery from Waimate opposed to coal from Invercargill which has resulted lower carbon emissions.

During the first twelve months of operation, a forest fire occurred at one of the locations Pioneer sources from in Tekapo/Twizel area. If the supply contract had specified this location as the source of the biomass, which it did not, then McCain may have been at risk of a supply chain interruption

4.2 Construction Contracts

McCain engaged Lyttleton Engineering for the 'turnkey' Engineering Procurement and Construction (EPC) for the biomass handling and feed system, and boiler modification work. They were not involved in the civil works of the project. McCain engaged Lyttleton with a performance-based contract, which meant that Lyttleton ensured that the entire system worked to achieve optimal performance.

Lyttleton Engineering's main sub-contracts are listed below, this list is not exhaustive:

- Living Energy provided the Toploader biomass handling and feed system, and installation supervision
  - Note that McCain did not engage Living Energy directly to install the Toploader system. This may have increased costs slightly but decreased project risks by allowing Lyttleton to work directly with the Toploader Supplier which is critical for boiler operation.
- Prolec (Professional Electrics) for the electrical works and boiler control system

The fuel store building was project managed by McCain and included the following contractors:

- Silva Studio designed the fuel store
- Chapman Consulting Engineers completed the structural engineering on the fuel store
- Timaru Construction completed the excavation works, civil works and building for the biomass storage building
- Steel & Tube: McCain established a supply contract for structural steel with Steel & Tube. There was a global steel shortage during the fuel store construction, which caused supply issues with long lead time and high prices for structural steel globally. McCain were protected from the supply chain issues through the supply contract they had established.

The Toploader had the longest lead time of 6-8 months, but this did not delay the project because the enabling works, such as the fuel store, was completed during such lead time. The total project construction and installation timeframe was 12 months. The site steam was supplied by Boiler 1 when Boiler 2 was modified, converted and commissioned.

4.3 Biomass Handling & Feed System

It took longer than expected to commission the Toploader system, circa two months, due to some issues listed below:

- An item of control hardware was lost in transit from Europe, the site team had one built in NZ. The 'in house' encoder developed issues which were resolved through working with the supplier in Europe

- The gate to the fuel store bay has a limit switch which turns off the Toploader to allow a tipping truck to reverse in and tip the woodchip into the bay. The limit switches malfunctioned and were replaced with magnetic limit switches which worked

Some operational issues were also noted and are listed below:

- Blockages in the fuel feeder. Some larger biomass particles (say 300-400 mm length) have ended up in fuel delivered and blocked the fuel feeder. No method has been established to prevent this from happening while the boiler is operating. If the feeder blocks it has to be manually cleared out which causes some downtime.

Figure 12: Fuel Store Construction & Biomass Conveyor

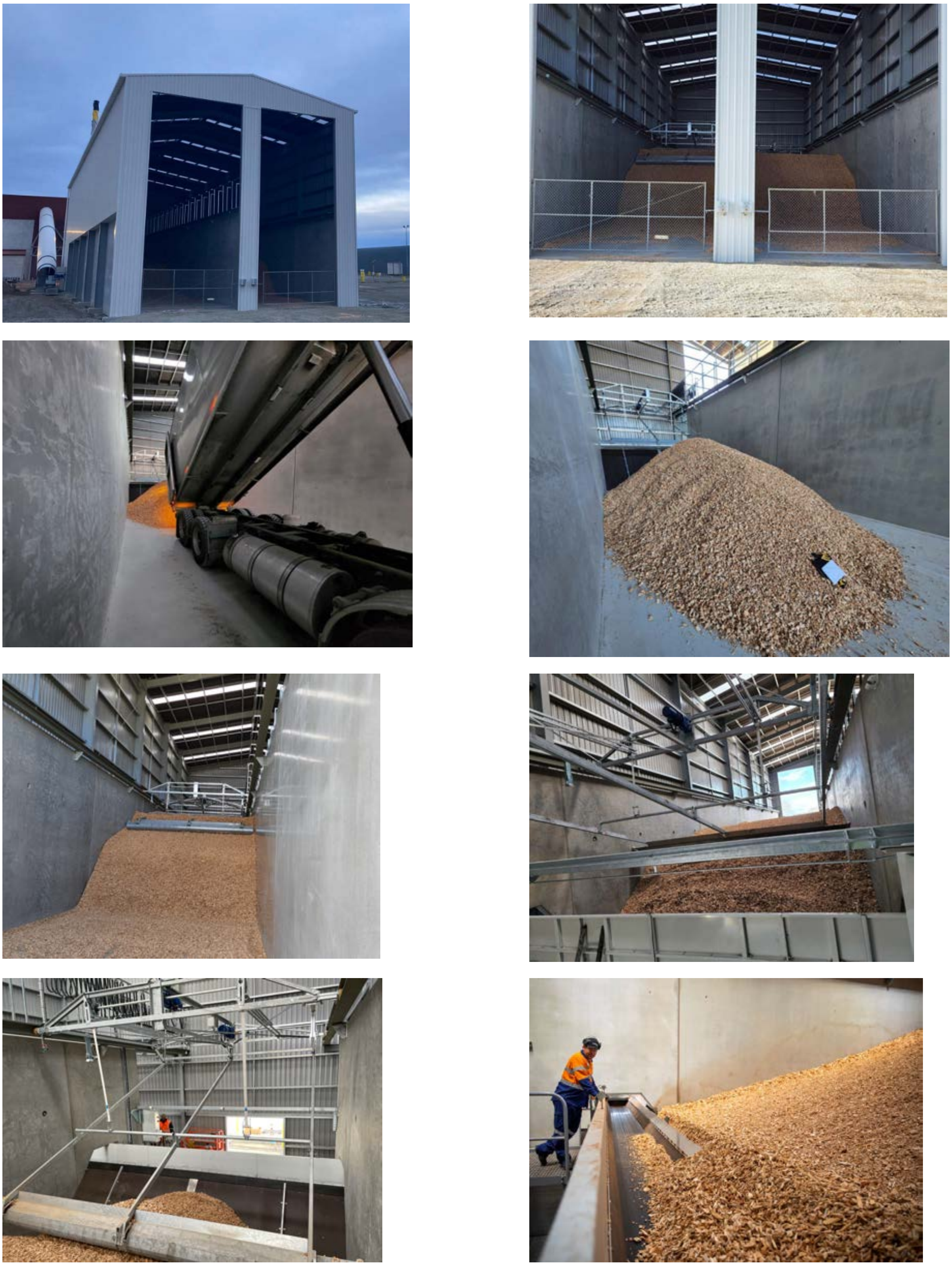

Figure 13: Biomass Toploader System

4.4 Travelling Grate Boiler

The biomass boiler originally had some issues which have since been resolved. The boiler was initially experiencing incomplete combustion of the woodchip and the pneumatic feeder reached high temperature. This caused the boiler to shut down and the sprinkler system to activate. Such issues were resolved by adjusting the feeder fan and increasing the gap between the air flow dampers.

Biomass combustion generates less ash than lignite, which means ash handling is reduced and the wastewater quality has increased. The ash is currently disposed of to landfill. Other options have been investigated but there is not enough ash for use elsewhere.

The boiler performance details and summary of commissioning results are listed in the tables below. The boiler operates at around 76-77% gross thermal efficiency, which is equivalent to when the boiler was fired on coal.

Table 2: Boiler Performance Details

Parameter	Unit
Maximum Continuous Rating (MCR)	14 MWth, 21 t/hour steam, biomass federate is approx. 5 t/h
Average operating load	11 MWth, 16 t/hour
Operational pressure and temperature	22 bar(g) and 217°C

Table 3: Summary of Commissioning Results

Firing Rate (% MCR)	**Steam Output** (kg/hr)	**Furnace** (°C)	**Flue Gas Temp** (°C)	**Flue Gas Oxygen** (%)	**Carbon Monoxide** (ppm)
0	2,625	421	131	13.35	428
20	4,956	495	136	10.12	220
30	6,094	571	141	6.47	108
40	7,408	642	145	5.58	35
50	12,644	735	160	5.39	24
60	12,193	839	162	5.98	26
80	15,575	875	177	4.83	43
100	15,300	876	176	6.15	61

4.5 Commissioning Timeline

Just prior to the project starting, the carbon credit (NZU) price began to spike to roughly $90/t. This had a significant impact on the operational cost for McCain and as a result they wanted to start the project early. It was agreed with Lyttleton Engineering to start the project 6 weeks ahead of schedule and a grace period was added which allowed them to fine tune the boiler to the agreed performance.

4.6 Potential Conversion of Boiler 1

The standard McCain policy globally is not to have a back-up boiler. Due to historical reasons, with Boiler 1, McCain Timaru has currently got a back-up boiler capable of meeting 100% of the site load. McCain want to remove all coal boilers so McCain are investigating the work required to convert Boiler 1 to wood chips, in order to remove the risk of firing coal should Boiler 1 be run.

Boiler 1 would be derated on conversion to woodchip, due to the lower energy density of wood chip compared to subbituminous coal, but the derated boiler still meets the site demand. This conversion would use the same biomass storage and handling system as Boiler 2. The conversion would largely be on Boiler 1 with an additional feed conveyor. The indicative cost is currently $0.5-1M.

5 Approvals & Consents

5.1 Approvals

McCain initiate projects with a project charter. Once sufficient engineering is completed a Business Case is developed which requires approval of the Final Investment Decision (FID) from the appropriate level of authority within McCains management and governance structure.

The business case consists of the following:

- Secure biomass fuel supply
- Confidence in contractors to deliver project
- Removes coal from a McCains site – there were five sites firing coal out of 59 sites globally at the time
- Class 1 cost estimate to within +/-10% accuracy, based on quotes from suppliers and contractors
- 20% Internal Rate of Return (IRR), which was met with:
  - Carbon price of 70-75 $/t at the time
  - The boiler conversion project and another heat recovery project on the same site was financially supported by the government - EECA provided approximately $2,876,500 in co-funding for both projects through the Government Investing in Decarbonisation Initiative (GIDI).
  - Note that McCains had two IRRs, the national 'true' IRR and an international one which used a global average carbon price, both of which had to be acceptable in order for the project to be approved

5.1.1 AACEi

The Association for the Advancement of Cost Engineers international (AACEi) set out a classification system for cost estimates which follows the project development framework. Additional project definition provides a more accurate cost estimate, as shown in the table below.

Table 4: AACEi Cost Estimation Classification

AACEi Classification	AACEi Accuracy Range
Class 5	Low: -20% to -50% High: +30% to +100%
Class 4	Low: -15% to -30% High: +20% to +50%
Class 3	Low: -10% to -20% High: +10% to +30%
Class 2	Low: -5% to -15% High: +5% to +20%
Class 1	Low: -3% to -10% High: +3% to +15%

5.2 Resource Consent

McCains had to prove with Environment Canterbury that the existing resource consent could be met with biomass. During commissioning, McCain demonstrated that the boiler could meet the existing agreed particulate limits on the air discharge consent. The table below shows that there are less particulate emission with biomass compared to coal.

Table 5: Particulate Emissions

	Coal	Woodchip	Units
Actual concentration of particulates	59	35	mg/m^3
Concentration of particulate matter	64	33	mg/m^3
Particulate matter emission rate	1.26	0.41	kg/hr

6 Summary & Shared Learnings

McCains have successfully switched fuel from coal to biomass on Boiler 2. The conversion project was within the planned schedule and below the estimated budget. The fuel switch from coal to biomass has resulted in the following outcomes, costs and co-benefits:

- The total project cost for the boiler conversion was $3.4M
  - Approx three quarters of the total project cost was attributed to the fuel store
  - The boiler conversion project and another heat recovery project on the same site was financially supported by the government
- Fuels costs has reduced by around $0.6M per annum with the conversion
- The reduction in carbon emissions is estimated at 30,000 tonnes per annum which has significantly reduced McCains carbon costs associated with process heat
  - Note that this also includes a fryer heat recovery project
- Maintenance costs are less
- Operational costs, associated with staff and labour to run the boiler, are the same
- McCain are investigating the conversion of Boiler 1 from coal to wood chips, to remove coal from its New Zealand operations entirely

Table 6: Summary of Shared Learnings

Category	Shared Learnings
Knowledge of best practice	▪ Engage suitably qualified resources to assist in the design development of the project ▪ McCains engaged a range of local engineering firms and national consultants to obtain extensive advice. Lyttleton Engineering were experienced in boiler coal to biomass boiler conversion, having completed several similar conversions in New Zealand
Design development	▪ Client involvement during the design development and construction phases is critical to ensure that the asset has minimal issues over its lifetime ▪ McCains project managed the project and had a good understanding of the scope and provided feedback on the design and build throughout
Redundancy	▪ With Boiler 1, the site has currently got a back-up boiler capable of meeting 100% of the site load
Biomass fuel storage location	▪ Biomass is less energy dense than coal and needs more area for storage onsite for the same amount of energy. McCains had the biomass fuel store built approx. 50m away from the boiler, which allows the following: – Used existing free space onsite – Ringfenced construction of the fuel store – The boiler continued operated on coal during the majority of construction – The distance provides a fire break between the boiler and the fuel store
Resilience of biomass supply chain	▪ McCains agreed a fuel supply arrangement with a Pioneer Energy, who McCain saw a potential 'Business Partner' ▪ Pioneer source the biomass from the central South Island, 'local' to the site in Timaru ▪ Fuel store can hold 2000 m^3 to allow for three days without fuel deliveries, which accounts for a long weekend and contingencies around weather
Components from overseas	▪ Lyttleton Engineering demonstrated initiative by getting an encoder built in NZ because the overseas component was lost in transit
Boiler conversion	▪ The boiler thermal efficiency on biomass is higher than on coal
Availability and quality of construction contractors	▪ McCains had developed a professional working relationship with Lyttleton Engineering, which had installed the original coal-fired Boiler 1 and Boiler 2 ▪ The project can be split into the 'fuel handling & feed system' and 'boiler conversion'. Both of these parts were delivered by one company, which reduced potential issues with interfaces between different suppliers and installers. The alternative approach was to have multiple separate contracts. This single turnkey contract procurement approach is suitable for projects where managing multiple contracts may add too much project risk for relatively small cost savings ▪ McCains started the project six weeks earlier than planned in order minimise costs to high carbon prices at the time

7 Types of Biomasses

Common types of solid biomass fuel are listed in the table below:

Table 7: Common Types of Solid Biomass Fuel

Biomass Type	Description	Image
Wood Pellets	Wood that has been pulverised and densified (pelletised) under heat and high pressure to produce a cylindrical wood derived fuel of consistent size.	
Wood Chips	Chipped woody biomass in the form of pieces, with a defined particle size produced by mechanical treatment with sharp tools such as knives.	
Hog fuel	Fuel wood in pieces of varying size and shape produced by crushing with blunt tools such as rollers, hammers or flails. These fuels are typically of a lower quality compared to wood chip.	
Urban Wood Fuel	Wood residues derived from the urban activities including packaging materials, off-cuts from manufacturing, construction and demolition used wood residues, yard trimmings, arborist trimmings, urban tree residues and from land clearing	

Wood pellets can meet the following standards, DIN Plus and/or EnPlus and have low moisture <10% by weight and high energy density of 16-17 MJ/kg. Wood chips, hog fuel and urban wood fuel can have a range of fuel properties, which can be classified according to technical standard *'ISO 17225-1:2021(en): Solid biofuels — Fuel specifications and classes'*. A guide for biomass fuel specification is provided by the Bioenergy Association which is based on ISO 17225. Biomass fuel is typically described by the following properties: particle size (P), fine fraction, moisture content (M), ash (A), bulk density (kg/m3) and energy density (MJ/kg). Classified biomass fuels must be free from non-wood contamination, such as soil and stones. Common biomass fuel properties are shown in the tables below.

Table 8: Moisture Content

Moisture *weight percentage as received	
M20	≤ 20%
M30	≤ 30%
M35	≤ 35%
M40	≤ 40%
M55	≤ 55%
M55+	≤ 55+%

Table 9: Particle Size

Main Fraction *>60% weight	
P16	3.15 ≤ P ≤ 16mm
P45	3.15 ≤ P ≤ 45mm
P63	3.15 ≤ P ≤ 63mm

Table 10: Fine Fraction

Fine Fraction *weight percentage with P<3.15 mm	
F02	≤ 2%
F05	≤ 5%
F10	≤ 10%
F20	≤ 20%
F30	≤ 30%
F40	≤ 40%

Table 11: Ash Content

Ash Content *weight percentage of dry basis	
A.0.5	≤ 0.5%
A1	≤ 1%
A3	≤ 3%
A5	≤ 5%
A6+	≤ 6% - Actual value to be stated

Contact

For more info visit eeca.govt.nz/biomass-boiler-case-studies or email eecaenquiries@eeca.govt.nz