



Case Study

Mount Gambier Aquatic Centre Biomass Boiler

March 2014



Background

The Mount Gambier Aquatic Centre was constructed by the Mount Gambier City Council in the 1980s as an outdoor pool facility for the local community. The Centre has three pools – an Olympic sized pool, a toddler pool and a learner pool - for a total volume of 1.38 ML (including balance tanks). The large pool is heated to 27-28°C, the smaller learner pool is heated to 30-32°C.



The Centre is open seven days a week for six months of the year, from the start of October to the end of March.

From the very beginning of the facility the pool water was heated by a biomass boiler, and via two heat exchangers whose combined capacity is 520 kW. The original biomass boiler ran on fresh sawdust from a local timber mill. After thirty years of dedicated service the original boiler had become unreliable and difficult to operate.

Replacement options were investigated and included a straight gas boiler, a combined solar hot water and gas option, and biomass boilers. All options were subjected to a triple bottom line assessment, which included analysing potential capital costs, operating costs, community benefits and costs, and environmental benefits and costs. The conclusion of this analysis was that whilst a biomass boiler would have a higher capital cost than a straight gas boiler, the running costs would be cheaper, which results in significantly reduced costs over a ten year period. Purchasing biomass from the local forestry industry supports local jobs, as opposed to importing gas from outside the region. The trees that the biomass is sourced from are regrown, and so the fuel source is essentially carbon neutral, as opposed to gas which is a fossil fuel that contributes to human-influenced global warming.

Following on from this analysis a tender was released for the supply of a new biomass boiler for the Aquatic Centre.



650 kW Binder Boiler

Living Energy were selected as the company to supply the new boiler. Their proposed solution was a boiler manufactured in Austria by Binder, rated by the manufacturer as having a theoretical maximum output of 650 kW. It is a more technologically advanced boiler than the original one at the Centre, is more responsive to changes in heat demand (which are in turn influenced by the weather), and can be monitored and settings changed remotely over the internet.

The Binder boiler has automatic ash removal, which significantly reduces the maintenance cost on the previous system, which had to have ash manually removed an average of three times per week.

The boiler only produces heat, not electricity.



Feedstock

The boiler runs on dry woodchip, with the ideal moisture content being 20-30%. The long term source of wood chip is pine (*Pinus radiata*) sourced from the local forestry industry. In the start-up phase a variety of dry hard wood chip was tested with the new system. These were sourced from logs at a Council stockpile, resulting from trees that had been felled by maintenance activities of Council staff. The boiler ran well on this feedstock, but the feed system was regularly jammed by over-sized pieces. The contractor that was used to chip the logs did not have a screen on their operation, meaning Council staff had to manually screen the chips as they were being loaded into the bunker. This will not be an issue in the long term, as the source of pine wood chip uses a screen as part of their chipping operation.



Council has considered using untreated urban timber waste collected at its Transfer Station, and may conduct a trial in the future. Even if the trial is successful this would only supplement the main source of feedstock.

Performance

Running on dry wood chip the boiler heats the water very efficiently and without any issues. It is able to raise the temperature of the water much quicker than the previous system. Customers have been happy from a pool users perspective.

Estimates to date indicated that the new boiler uses approximately the same amount of tonnes of feedstock as the old boiler. For convenience sake it would have been preferred to maintain the existing feedstock supply chain, but with the variable daily heat load and on-off controls on the heat exchanger pumps the Binder needs to run on dry feedstock, which local timber mills are unable to provide. This has required tapping into the existing supply chain that feeds the local MDF mill. Dry wood chip is more expensive per tonne than fresh sawdust, but it has a higher energy content, and the drier feedstock provides operational advantages



compared to a wet fuel, such as better turn-down, easier ignition, and less tars produced upon cool-down.

Feedstock costs are higher with the new system, but it is still much cheaper to run than a gas system.

The unit uses between 5 m³ and 10 m³ of wood chips per day, the exact amount being influenced by the weather, with less wood chip being required in warmer weather. It is anticipated that the unit will use approximately 2,150 m³ (550 tonnes) of wood chips over the six months that the pool is open.

Payback Period

When comparing the biomass system to the most likely alternative – a straight gas boiler – the payback period is approximately 4 years. If natural gas prices do increase significantly within the next few years as predicted¹, then this period becomes even shorter.

¹ Core Energy Group Pty Ltd (February 2012), Price Pathways to 2020 – Gas and Electricity.

Teething Problems

There have been some minor teething problems since the installation of the new system, with numerous being as simple as changing settings.

Switching fuel from sawdust to woodchip caused some problems, though these related to the existing feed system and not the boiler.

Some of the sensors and alarms on the new boiler had to be adjusted to suit the local situation.

Advantages and Disadvantages

Advantages

In this particular situation a biomass system is much cheaper to run than a straight gas system. Even though it has a higher capital cost, when the capital and operating costs are averaged out over ten years the biomass system is still much more cost effective on an annualised basis than gas.

The utilisation of wood chips from the local forestry industry supports local jobs. The skill set of local workers involved in the project is also expanded.

It is the most environmentally friendly of the options analysed, as it is carbon neutral and utilises a renewable energy supply.

Disadvantages

The main disadvantage with this kind of biomass systems is that it requires more human input than a straight gas system. With the latter system, the fuel is piped in and the system runs mostly automatically, requiring little human input. With a biomass system, the trees need to be harvested and chipped (which in most situations will be occurring regardless, wood chips are simply purchased that were going to be made anyway), the chip needs to be stored (unless they can be made on demand, but for smaller systems this is unlikely to be cost effective), and it needs to be delivered to the site. Even with these costs factored in, it is still cheaper to run than a gas system, and it is supporting local jobs.

Final Reflections

Biomass boilers are not common for this kind of application in Australia, but are very common in Europe, North America, and becoming more common in New Zealand. Biomass systems can compare financially favourable when compared to gas systems – especially when gas prices are projected to significantly increase in 2015 for a variety of reasons, including the export of significant volumes of Australian gas to the international market². Capital costs may be higher, but

² Core Energy Group Pty Ltd (February 2012), Price Pathways to 2020 – Gas and Electricity.

operating costs can be significantly lower, though this needs to be analysed for each particular situation.

One of the keys to making a bioenergy project financially viable is to utilise the heat. Some systems can create electricity, but the heat still generally needs to be utilised to make them viable. However, these projects can be viable when they are only generating heat, and not electricity, which is the case with the Mount Gambier Aquatic Centre installation.

A level of energy independence can be achieved, through securing a local source of energy (biomass feedstock), as opposed to importing fossil fuel energy from outside the region. The energy source is also renewable, carbon neutral and environmentally friendly. It is important that a reliable long term source of feedstock is secured for bioenergy projects to be viable.

Bioenergy projects support local jobs through the purchase of feedstock from local industry, rather than importing gas or electricity from outside the region. The skill set of local workers can also be improved. Local companies were used as part of the installation of the biomass boiler at the Mount Gambier Aquatic Centre, and were trained up on the job by staff from Living Energy.

Councils may wish to investigate utilising woody material that they collect directly or at their transfer stations, as a feedstock for a biomass unit. The Mount Gambier Aquatic Centre experience indicates that logs and branches that are left to dry for 6-12 months can be chipped and provide a good source of feedstock. It is essential that the resulting wood chip is within the ideal moisture content range, and also that it is screened to remove over-sized pieces which can jam feed systems. In theory un-treated urban timber waste could also be chipped and utilised, but this has not been tested at the Mount Gambier facility as yet. In addition to screening, a magnet would also be required to remove nails, screws and other pieces of metal. Clear separation from treated timber, painted timber, and timber with other contaminants such as plastics would need to occur, as these should not be burned in a biomass system. Using these woody materials may not only save on feedstock costs for a biomass system, it may also provide a beneficial use for a waste stream.

On this last point, biomass projects can make beneficial use of a waste stream. A significant amount of biomass in a variety of forms routinely goes to waste throughout Australia. Much of this can be utilised beneficially, including for energy.

