Holiday Park offers sun-on-tap

CASE STUDY

Key features

- Large scale solar water heating system installed in Raglan
- Old oil-fired furnace replaced with modern computer controlled solar water heating system with gas back-up

Key benefits

- Savings of $2,000 per month estimated
- A significant reduction in CO_2 discharge achieved – approximately 90 tonnes per annum
- 81% energy saving calculated over summer months

At Kopua Holiday Park in Raglan they can't always guarantee that the surf is up, but they can offer the sun on tap. That's because they've installed a large scale solar water heating system on their main kitchen and ablution block that delivers plenty of hot water when it's needed.

This case study describes how Kopua Holiday Park replaced an old oil-fired furnace with a modern computer controlled solar water heating system with gas back-up, and what the park operators think of the result.

About Kopua Holiday Park

The Kopua Holiday Park is located on Marine Parade in Raglan. It is surrounded almost entirely by water and beaches, with vehicle access by a lone bridge. It is a New Zealand camper hot spot and in peak season services up to 1,500 campers spread across 300 sites.

In recent years, two ablution blocks have serviced the campers' needs. Five hundred campers are serviced by the newer of the two, and the original larger block services 1,000 campers. A third ablution block has also just been completed to spread demand evenly across the entire park site.

The original ablution block used an oil-fired boiler for its hot water requirements. It was old and in need of replacement, creating the ideal opportunity to install a modern, energy efficient system.

Retrofit considerations

The boiler in the original ablution block provided hot water for 12 showers, 12 hand basins, 3 laundry tubs, and 17 kitchen sinks. The oil-fired boiler was old and unreliable, and the surrounding pipe work was heavily calcified.

The amount of solar energy available to be captured between summer and winter varies significantly.

The average monthly energy bill was around $2,600 depending on occupancy, and maintenance costs were on top of that. A major retrofit of some alternative form of water heating was required.

The use of solar energy was factored into the decision to invest in a new system on the basis that the energy contribution from solar has been proven many times to provide a very good return on investment. Solar water heating is also particularly suited to tourist accommodation facilities as hot water is always available when the guests arrive, yet costs nothing to keep hot when guests are not in residence.

However, as is the case with most solar water heating installations, an additional heat source would be required for periods of high demand on the hot water, and for periods of low solar radiation. As gas was already being used extensively in the park for kitchen stoves and for water heating in the new ablution block, it was the logical heating top-up option to work with the solar water heating system.

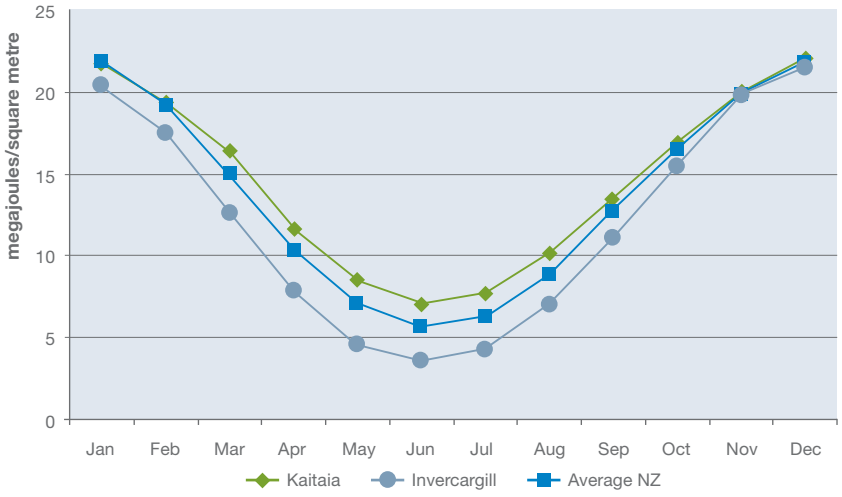
Another key consideration was to determine optimum sizing of the solar water heating system. The newest ablution block comprised ten new showers and six new wash basins. With it nearing completion, there was an option to deliver its hot water requirements from the one retrofit installation at the original block. Their separation of over 100 metres was a key factor to consider in the viability of the option.

The solar solution for motor camps through to exclusive retreats

The opportunity for solar water heating in New Zealand is particularly good due to our high solar radiation levels. While there is some variation in the energy levels available between the top of the North Island and the bottom of the South Island, all parts of the country can use solar energy to produce hot water cost-effectively.

The amount of solar energy available to be captured between summer and winter varies significantly. This has implications for tourist accommodation operators. If seasonal occupancy peaks coincide with the solar radiation peaks between October and March, then hot water energy bills can be cut by up to 75% through the use of solar water heating. For those operators catering to a winter tourist trade, solar water heating can also make a significant difference to power bills, but a high capacity electrical or gas back-up system will be required to maintain the flow of hot water in those dark winter months.

Daily average of solar radiation



The three Rheem 26 gas heating units top-up the heat in the three cylinders below when needed.

The solution

At the heart of the solution are 3 x 1,000 litre GreenGlo cylinders that each contains two separate heating coils.

The lower coil in each cylinder is connected to the 48m^2 array of 24 Edwards Titan solar heating panels positioned on the roof of the kitchens next to the original ablution block. A smart controller measures the temperature difference between the water in the cylinders and the fluid in the solar panels. The controller activates a pump to circulate the heating fluid from the solar panels through the heating coil in the cylinders when there is a temperature differential of 7 °C or more between the two, thus heating the water in the cylinders.

The upper coil in each cylinder is connected directly to one of three Rheem 26 gas water heating units. The job of the gas heating units is to maintain the temperature in the upper half of the cylinders at 50 °C. A temperature sensor in the cylinder triggers a pump whenever the temperature falls below 43 °C, thus firing the gas heating units. A timer also runs the gas units every few days to bring the cylinders to over 60 °C as a safety precaution against bacteria.

The entire water heating system is located at the original ablution block. The decision was made to service the new ablution block's hot water needs from the main block, rather than install a separate water heating system. The two are connected by a highly insulated Fusiotherm ring main recirculating system. A UV filter is also installed in the recirculation system to ensure high water quality is maintained.

A timer also runs the gas units every few days to bring the cylinders to over 60 °C as a safety precaution against bacteria.

The result

Rob Clark, Manager of Kopua Holiday Park says "We're absolutely thrilled; the system far exceeds our expectations. We were spending $3,500 per month on diesel for the old boiler in the peak summer months (average $2,600 per month over the whole year), and this summer we've only spent $700 per month on gas with the new system. I've calculated an 81% energy saving over those summer months".

Rob's estimate is that over the year the park is saving around $2,000 per month on average, or $24,000 per annum. This is a very good return on the project outlay of $75,000.

The insulated recirculation system delivering hot water to the new ablution block is also working extremely well. Rob measures the temperature at the exit and return points and has observed only a 1°C heat loss along the entire 200 metre return trip.

Rob also keeps an eye on the performance of the solar panels. For example, he noted that when the outside temperature was just 10.6°C with cloud cover and a cool wind blowing, the heat in the solar panels was 50°C and was maintaining the water in the cylinders at 49°C. The result was that the gas back-up units didn't need to operate at all during the day.

An added bonus from the project has been a significant reduction in CO_2 discharge by approximately 90 tonnes per annum. The old diesel boiler had been burning around 30,000 litres of diesel a year, generating 100 tonnes of CO_2 discharge into the atmosphere. The new gas top-up heating system is consuming around 3,000 kilograms of LPG, generating less than 10 tonnes of CO_2 discharge into the atmosphere. This dramatic saving is attributed to the contribution of the solar water heating (26%), and the vastly greater efficiency of the new gas heating system, new storage cylinders, and insulated recirculation system (74%) compared to the corroded old diesel boiler and associated equipment.[1]

[1] CO_2 offset calculations are based on:

Energy source	CO_2 output t/MWh	Price per litre or kg	kWh energy potential
Gas (bottled)	0.215	$2.80	14.00
Diesel	0.248	$1.00	12.97

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