
Australian Government
Department of Industry

Dairy Australia
Your Levy at Work

# Industry project for smarter energy use

## Case Study: Max and Tameeka Vera, Denison, Gippsland

Max and Tameeka Vera share farm at Denison, milking 370 cows on 110 ha to produce around 2.2 million litres of milk, milking 365 days per year. The cows are milked on a 50 cluster rotary platform from 5.00-6.45am and 3.30-4.45pm each day with a further 15 minutes for clean up. Milk is stored in a 16000 litre horizontal vat cooled by direct expansion using four scroll compressors. For two thirds of the year they are on a daily pick-up and on skip-a-day pick up for the remainder of the year.

Two stock water pumps and a travelling irrigator also draw power from the dairy meter so total energy consumption is higher than expected for a dairy of this size. For the period leading up to the audit the farm was paying 25.9 c/kWh for peak power, 13.9 c/kWh for off-peak power and a monthly fixed cost of $29.73 (all costs ex GST).

When Max and Tameeka first came to the farm the dairy had a reverse flow plant wash system that used nearly 1500 litres of hot water each day. They realised this was costing them money so they installed a third line wash system and moved to a lower temperature acid that reduced hot water consumption to 500 litres per day. This allowed them to turn off one of the two hot water systems, saving them almost $2,500 per year and reducing carbon emissions from the dairy by nearly 24 tonnes CO2-e. This was a great start!

*Max and Tameeka Vera with sons Fabian, Harrison and Jenson (Photo courtesy of The Weekly Times)*

### Dairy energy audit – the process

As part of the audit every piece of electrical equipment was identified and estimates made of how long each element operated in a normal day and the sort of load that the equipment was normally under.

### The following results were found:

1. **Milk cooling** – Max measured the temperature of water entering the plate cooler (single bank: industrial) and the temperature of milk leaving. The difference was 2°C as expected, indicating that the plate cooler was doing its job. He then measured milk volume in the vat and how long it took for the refrigeration plant to drop milk temperature down to 4°C. This provides an indication of cooling performance and from this performance efficiency can be estimated. As a rule of thumb, the refrigeration unit should be able to cool 60% of the volume of the vat to 4°C within three and a half hours of the start of milking. The vat compressor run time measurements indicated that the milk was taking too long to chill so there may be a problem there – something for Max to follow up.
2. **Cleaning** – Most vats will be set to a pre-determined wash program determined by the manufacturer. Any problem here should be referred straight back to the agent who services the vat.

   However, plant wash cycles vary enormously depending on the design of the plant and the type of chemicals being used. Max and Tameeka had already made changes to the cleaning system and saved themselves plenty of money. They had the system running well so there were no new savings there.
3. **Water heating** – There are two main questions to ask when looking at water heating – is the water at the right temperature (not too hot, not too cold) to do the job it is intended to do and does the amount being heated match the needs of the wash program?

**Vat wash hot water** - At Max's dairy there were two domestic hot water services for the vat wash. The larger of the two also supplied hot water to a tap for general dairy use. However, this seemed a little odd when the vat wash program needed only 160 litres per day and an estimate of only 20 litres per day for miscellaneous use. Close inspection of the plumbing indicated that the larger hot water service was not linked to the vat at all but had been used to supply hot water to a second smaller vat that had been disconnected for quite some time. One hot water service was enough for all vat hot water needs so one should be switched off.

The temperature of the vat hot water should be 65-70°C but when measured it was nearer to 40°C. The vat wash cycle had just finished when the audit began so cold water must have refilled the hot water service, lowering the temperature. In this case it was not a problem because water at 65°C would not be needed until the vat was washed again the next morning and in the meantime off-peak power would bring it up to the correct temperature. However, it's worth checking the temperature of both the plant hot water before the afternoon milking to see that it is 82°C+ and vat hot water services before vat wash to see that it is 60°C+. If it's not, then check out why.

**Plant wash hot water** – The original system had two 850 litre hot water services linked by a manifold to the cleaning system. Max had switched off one hot water service and closed the gate valve on the manifold to isolate the second tank. It was strange to find that the water temperature in both tanks was about the same at 82°C. A little investigation revealed that the gate valve on the manifold had been knocked and was partially open, bringing the volume of the decommissioned tank back to be heated by element in the first tank – this added an unexpected water heating cost.

Both of the plant hot water services had seen better days so Max could consider the replacement of them both with a single smaller unit that could supply the 500 litres that they now need.

4. **Equipment** – Pumps, augers, lighting and other miscellaneous shed and office equipment were included and all seemed to be working as they should and were fit for the task.

## Dairy energy audit – findings & recommendations

Power usage can be allocated to the main tasks in the shed. Each dairy will have a different pattern of usage based on the type of dairy, type of equipment, heating and cooling systems, or whatever else runs through the dairy meter.

## Total Energy Consumption - Vera

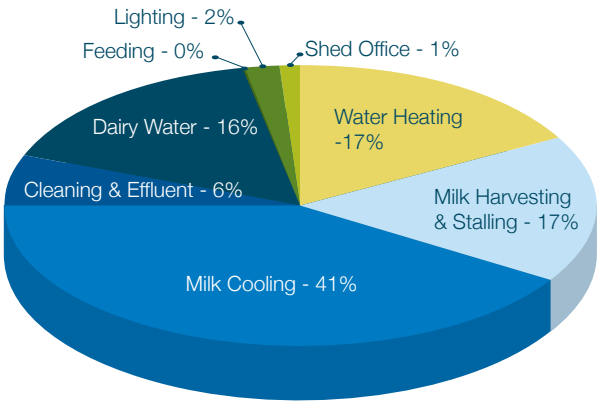


*Figure 1: Breakdown of power usage at the dairy meter*

The following recommendations were made:

1. Vat cooling performance is poor. Re-check measurements. If still poor, immediate investigation is warranted. A 20% improvement in performance will save about $1,500 /year.
2. Switch off the HWS that feeds the tap only and re-plumb the smaller vat HWS to supply the tap. Permanently disconnect the main hot water service that has been switched off to stop the flow of water between. Use of cold water chemicals has reduced the demand for hot water so when the main HWS needs replacement consider a smaller unit around 600 litres. Consider installation of a water pre-heating system (ideally picking up compressor waste heat) to supply warm water to both HWSs (save about $1000/year in water heating costs).
3. Lower the thermostat on the main HWS to around 90- 92°C. Water entering the plant at 84°C will boil. A starting temp of 85°C in the wash drum is the target for hot water cleaning.

   Improved energy efficiency as recommended will reduce carbon emissions by 10.5 tonnes CO2-e or 7% of emissions from the dairy.

## So, was it worth the effort?

"We thought we'd done plenty to save energy already but it was good to get a new set of eyes looking at our setup to see new things. I think everyone should have a dairy energy assessment", said Max.

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