Australian Government
Department of Industry

Dairy Australia
Your Levy at Work

Industry project for smarter energy use

Case Study: Brendan Martin, Bamaum, Murray

Brendan Martin of Allanby Pastoral runs a 720 cow dairy operation at Bamawm. He uses approximately 200,000kWh of energy annually.

Brendan has seen his electricity bill double over the past 3 years, an increase of more than $1,000 per month, and he was keen to investigate any strategies that could be implemented to reduce this.

Brendan signed up for an energy assessment which revealed exactly where energy was being used on farm and how much it was costing the business (Table 1). It was found that the two major energy uses on farm were milk cooling at 45 per cent and water heating at 18 per cent. This gave Brendan a starting point to work out if he could improve his energy use efficiency.

Table 1: Energy assessment data from Allanby Pastoral farm

	kWh/day	$ /day	kWh/ year	$/year
Water heating	114.38	$ 7.31	41,749	$2668.41
Milk harvesting	71.65	$ 10.80	26,152	$3941.53
Milk cooling	271.90	$ 30.35	99,244	$11,079.12
Cleaning and effluent	14.53	$ 2.22	5,302	$811.52
Stock and dairy water	49.29	$ 4.89	17,989	$1786.15
Feeding	61.25	$9.45	22,356	$3,450.86
Shed / work-shop/ misc	12.07	$ 1.20	4,406	$437.43
Lights	12.3	$ 1.71	4,490	$624.39
Total	607.03	$67.94	221,687	$24799.41

Plate cooler

As milk cooling occupied a large use of energy on farm, the assessment looked at ways this could be reduced. The assessment reviewed the performance of the plate cooler and found it to be very poor with a 7.7 degree difference between water entering and milk leaving the plate cooler. To maximise energy efficiency, ideally this difference should be a 2 degree difference or less.

The most common causes of poor performance in plate coolers is cleanliness and relative flow rates between water and milk. It was found that Brendan's flower rate was mostly likely to be the cause behind poor plate cooler performance. As a general rule a flow rate of 2:1 of water to milk is required to achieve the best performance. To address this issue, the pipes need to be checked and cleaned, and Brendan found he needed a new plate cooler pump installed, at an estimated cost of $900.

Addressing the plate cooler performance and having the milk entering the vat at 20°C would save approximately $4,300 a year, with a payback of less than 3 months. This also would lead to a saving of 27.6 tCO2-e in GHG emissions.

Cooling tower

The performance of the cooling tower was also assessed. Measurements indicated the cooling tower was cooling the water to within 6 to 7 degrees of the wet bulb temperature.

According to the manufacturer, a 3°C differential is achievable, suggesting there was around a 3–4°C opportunity for improvement. Performance of Brendan's tower was being impacted by a low flow rate and an aging "fill" in the tower. A replacement fill was estimated to be $800.

By increasing the performance of the tower by 3°C , savings on approximately $1,520 a year could be made, with a payback period of 6 months. This also would lead to a saving of 9.7 tCO2-e in GHG emissions.

Vat

The assessment also discovered the vat was under performing. The vat's internal design was possibly the major cause of its low cooling performance. The design limitation in the vat meant that the use of a heat recovery unit in pre cooling milk before it enters the vat could reduce energy use in milk cooling and also lead to further energy savings through pre heating water. On Brendan's farm there is possibly sufficient heat load (from the amount of milk to be cooled each day) to meet most of the daily hot water requirements at 55–60°C.

The installation of a heat recovery unit is something Brendan could consider in the future. Heat recovery units are approximately $5,000–6,000 installed and the current low off-peak tariff rate Brendan uses to heat water makes it difficult to economically justify this cost. However, if off-peak tariff rates exceed 13 cents/kWh the economics dramatically shift.

Brendan is more than happy with the results and recommendations of the assessment. "It was all very thorough and we are always looking at ways to reduce costs and make our business more profitable," Brendan said.

"We decided to upgrade the pump on the cooling tower system to increase the amount of water to pass through the system. We also put a variable speed motor on the milk pump which cost around $1,500 (combined cost for both $3,500). This was a reasonably cheap outlay and has cut about four hours off our cooling time a day. It has helped bridge the gap and stopped milk going through in a surge, allowing it to cool more effectively. "Power usage in the dairy is down by 9 per cent. "With prices continuing to rise it is more important than ever to be energy efficient. Every little bit you do helps and even though our bills continue to rise through no fault of our own, we are definitely in front from a milk cooling perspective," Brendan said.

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