



Pumping up efficiency – milkshed makeovers

CASE STUDY

✓ Key features

- Landcorp two year project
- 27 dairy farms nationwide
- Energy audits undertaken
- New technology installed on 21 farms:
 - Refrigerator heat recovery systems
 - Variable vacuum pump drive systems
 - Variable speed drives
 - Insulation
 - 5 month installation period

✓ Key benefits

- 9% energy reduction
- 3.2 years average payback time
- \$51,000 savings per year

✓ Sector relevance

- Dairy Farmers

An energy audit across its 27 dairy farms gave Landcorp Farming an insight into technologies to save energy and money. The resulting changes have reduced energy use by 9% and saved more than \$50,000 in energy costs per year.

Producing over 10,000 tonnes of milk solids annually, and managing over 372,000 hectares of land, New Zealand's largest farmer has electricity bills to match.

Landcorp Farming, a state-owned enterprise, added dairy to its portfolio around 10 years ago, and quickly addressed the electricity cost burden that has long been recognised as part and parcel of the dairy industry.

Ensuring its energy was managed as efficiently as possible fitted with Landcorp's culture of best practice – as well as its desire to be a 'good corporate citizen' and industry leader in innovation.

Landcorp procurement specialist and project manager Vaughan Griffiths explains: "the majority of our 27 dairy installations are comparable to the best in the country and the technology we employ has to reflect best practice."

Starting the energy journey

Energy consultant Joe Schyns started working with Landcorp around the time it moved into dairy farming. He started by matching all incoming energy invoices nationwide to ICP numbers and physical installations on each farm.

"It's amazing how many people receive an invoice and assume it's correct. A farmer should always be able to relate the invoice to a physical place on the farm," says Joe.

Ensuring the farm is on the correct tariff is also vital.

"If you don't get the tariff right, it doesn't matter what you do to save electricity, you're wasting your time." For example, a farmer might push through electrical load into the night tariff assuming it will be cheaper – but if they're on a 24 hour tariff, it makes no difference.



High pressure water cannons minimize wash time and water usage.

Having put 'the basics' in place, Landcorp decided in 2007 to go further and conduct a full energy audit across all its dairy farms. The decision to do this was driven mainly by cost, says Vaughan.

"After watching the price per kilo (of milk solids) and cost per kilo lines converging, we took steps to minimise our operating costs. We broke down dairy expenditure into a pie graph and looked at what our big spends were per farm – not surprisingly, electricity was one of the largest items."

Undergoing the energy audit

On dairy farms, energy use is concentrated in the milking shed – including vacuum pumps, water heating and pumps, and milk refrigeration. From the outset Landcorp assumed it could achieve savings, as many of its farms had ageing equipment and hardware.

Landcorp employed energy consultants Natural Systems Ltd (NSL) to carry out audits on all its 27 dairy installations to get as accurate a picture as possible. This included installing temporary smart meters to record component usage (e.g. pump vs. heating) on each farm.

The audits came back with several recommendations. After analysing cost benefit ratios, Landcorp chose to implement three main technologies across 21 of its dairy farms:

- refrigerator heat recovery systems for generating hot water (combined on some farms with secondary milk cooling)
- variable drive systems on vacuum pumps; and
- variable speed drives on farm supply pumps.

They also decided to insulate hot water cylinders and pipes.

Landcorp opted to go only with measures that had a payback of five years or less, and could be practically implemented. It received a grant from the Energy Efficiency and Conservation Authority (EECA) to help with implementation.

The technology installed

- **Refrigeration heat recovery**

Refrigeration heat recovery collects waste heat from the refrigeration unit's air-cooled condenser, and converts the cold water into stored hot water, combining a plate heat exchanger with a heat pump to provide hot water at a higher temperature. This reduces the load on the refrigeration plant. For even greater energy savings, some farms combined heat recovery with secondary milk cooling.

- **Secondary milk cooling**

Secondary milk cooling was used in dairy shed installations with high ground-water temperature. Milk that normally would go from the cows into a primary cooler and then into the vat, instead goes through a secondary cooling system which runs on chilled water. This is combined with the refrigerator heat recovery unit, using energy taken out of the hot milk to pre-heat the water for the hot water wash systems.

- **Variable drive systems on vacuum pumps**

Variable drive systems on vacuum pumps maintain the vacuum at a constant level. When the vacuum system is in greater demand it increases the RPM of the motor, ensuring it only works at full capacity when needed. These systems also reduce noise in the milking shed.

- **Variable speed drives on farm supply pumps**

Variable speed drives are a similar technology to variable drive systems on vacuum pumps, but can be installed on any kind of pump (including vacuum, water, pre-cooling, wash-down, milk and effluent pumps). These help to avoid the huge loads which occur from constant starting and stopping of electric motors.

- **Insulation**

Just like energy saving in the home, insulating the milking shed's hot water cylinder and the pipes leading from it, is a low cost, instant energy saver. Most of the farm's got some form of water heating insulation.

The changes are expected to pay for themselves in an average of 3.2 years, reducing total energy consumption overall by 9%. That equates to a saving of \$51,000 each year.

Simple savers on the farm

- When there is opportunity, design or redesign farm layout for energy efficiency. Have one supply transformer with all lines going underground out from one central metering point, with check meters on individual buildings to monitor component use.
- Know what tariff you are on and where possible feed energy loads into off-peak tariff times. Timer switches can help.
- Take your own meter readings from time to time and match them to the invoiced reading.
- Maintain equipment regularly. Cleaning equipment and repairing leaks will save on running costs.
- Turn off all machines, equipment, lighting when not in use. Timer switches can help.
- Use efficient light bulbs (fluorescent instead of incandescent).
- Use natural light where possible (e.g. clear Perspex corrugated sheets).
- Check the water heater has correct thermostat temperature.
- Use gravity wherever possible rather than installing pumps.
- Ensure cow comfort in and around the milking shed to reduce effluent discharge and removal cost.

Landcorp's learnings

Vaughan recognises that there's never a perfect time to make capital outlay on a farm. But wise investment in energy management measures will pay for itself – sometimes in a surprisingly short timeframe.

Landcorp is already applying lessons learned to its new multi-million dollar Weka dairy development on the West Coast.



Variable speed water pumping reduces energy use and water hammer, and extends pump life.

“If we can cut energy costs, we can spend that money on other areas on the farm – increasing production dramatically.”

“We’ve spent several million developing the land and now we’re developing the milking shed incorporating everything we’ve learnt. The technology is very cutting edge.”

Vaughan emphasises that it’s not just about saving money for its own sake.

“There’s a lot of pride in the industry in running a really efficient farming business. If we can cut energy costs, we can spend that money on other areas on the farm – increasing production dramatically.”

Advice for other farmers

In Vaughan’s view, when times are tough in the dairy industry, farmers will increasingly look at how to minimise their costs – and a quick look at the budget will show that electricity is a major cost component.

“Years ago an electricity bill for a cow shed was a given cost and people just said ‘ok, that’s what it costs to go milking cows’ but as technology changes people see there are other options.”

Vaughan says that farmers considering making energy improvements should talk to people with similar set-ups to find what works – “because it’s a competitive industry and some suppliers make wild claims.”

“I think farmers should seek out good advice from professionals – including knowledgeable local contractors – who can give good options about improving efficiency. Do your homework and then follow those recommendations. You can save a lot, pretty simply.”



Monitoring of energy usage on the variable speed vacuum pump controller.

EECA enables organisations to increase their domestic and international competitiveness by adopting energy efficiency and renewable energy practices.

We work with businesses to identify the opportunities for energy management that are available to them and help them develop energy management action plans to make the most of these opportunities.

Good energy management has many benefits for businesses, including lower costs, increased productivity, reduced greenhouse gas emissions and a positive effect on the brand.

We have a particular interest in:

- encouraging new or under-used technology that can make processes more efficient
- projects that reduce greenhouse gas emissions, and
- developing the wood fuel industry.

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