

Agricultural Greenhouse Emissions Project

Energy

As Dairy sheds are generally large users of energy, it follows that there is a huge opportunity to improve efficiency and reduce costs.

Compare your use

To get a better idea of the efficiency of your dairy, find 12 months of energy bills and use the "energy monitoring" tool available at:

<http://www.cowtime.com.au/EnergyMonitor/index.aspx>

One problem in the area of dairy energy efficiency is that retailers sell single products rather than design integrated systems. As heating and cooling account for 80% of energy used in the dairy, it makes perfect sense to integrate these systems using heat exchangers.

Milk Cooling and Refrigeration.

Maximising milk pre-cooling will minimise the time that the mechanical refrigeration system takes to cool milk in the vat to the temperature required, and so will minimise the growth of micro-organisms.

The most cost effective methods of reducing the electricity required to cool milk are:

- install a pre-cooler and
- optimise the performance of the pre-cooler by:
 - selecting a large enough heat exchanger,
 - integrate a cooling tower and bury the plate water storage tank
 - fine-tuning water flow rates, and
 - ensure the cooling water is as cool as can be achieved economically.
- For example, if using a dam;
- Ensure inlet point is at least 1m deep
- Bury inlet pipe and maximise volume
- Shade dam if possible

Further information:

How effective is your platecooler. pdf

www.cowtime.com.au/technical/QuickNotes/Quicknote%204.6.pdf

Milk Cooling.pdf

www.cowtime.com.au/technical/QuickNotes/Quicknote%204.7.pdf

Best Practice Measures:

Options to reduce your energy usage.pdf

[www.cowtime.com.au/technical/QuickNotes/Quicknote 3.5.pdf](http://www.cowtime.com.au/technical/QuickNotes/Quicknote%203.5.pdf)

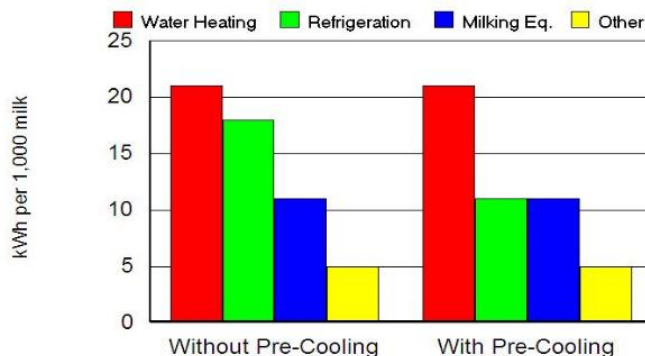
Dairy energy efficiency checklist.pdf

[www.cowtime.com.au/technical/QuickNotes/Quicknote 3.4.pdf](http://www.cowtime.com.au/technical/QuickNotes/Quicknote%203.4.pdf)

Minimising the Price of Energy

- purchasing energy at the best available tariff or contract rate, and
- using off-peak electricity where possible

Elements of Electricity Consumption in Dairies



Water Heating.

Water heating accounts for about 40% of the electricity used in dairy farms, but only about 16% of dairy electricity cost (because of the use of cheaper off-peak electricity).

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- ensure that the thermostat is not set too high and causing the water to boil
- water boiling in the cylinder (producing steam uses 10 times as much energy as heating it from cold to 95° C and the water is lost from the system). The water heaters are not designed for boiling water, and **so boiling should be prevented for safety reasons as well as cost efficiency.**
- maintain the water heater and piping to eliminate leaks, use insulation to reduce heat losses.

Recovering Heat from Milk

The heat removed from milk is a renewable source of energy and provides a huge opportunity to improve efficiency.

- **The heat removed from the milk from 200 cows in one day is about 163 kWh or enough energy to heat over 1500 litres of water from 15° C to 95° C (over double the amount required).**
- A de-superheater which can be fitted to refrigeration equipment is capable of heating water to 70° C.
- Heat can also be recovered from the milk pre-cooler heat-exchanger.

A case study analysis is available at:

www.cowtime.com.au/technical/Watts%20SA%20-%20Heat%20recovery.pdf

LPG

LPG is a cost-competitive method of heating water in dairies providing that:

- the price is around 80 cents per litre, and
- an instantaneous LPG water heater is used to heat water as the water is required for use.

LPG-fired water heating will also emit 83% less CO₂ (the major greenhouse gas) than electric water heating.

Source / Further information:

http://www.genesisnow.com.au/html/dairy.htm#minimising_consumption

Variable speed drives (VSD)

Variable speed drives can be used on pumps to significantly reduce the power used. The vacuum and milk pumps in many milking installations are designed to run flat out.

- The vacuum is controlled by the regulator letting more or less air in to the system, whilst the milk pump output is regulated by a valve or choke.
- A variable speed drive adjusts the speed of the motor controlling the milk or vacuum pump to allow the pump to run only at the speed required to create a desired vacuum or flow rate.
- By adjusting motor speeds, variable speed drives reduce energy use and prolong the life of equipment. A VSD on the milk pump can also improve the efficiency of heat exchange through a plate cooler, resulting in further cost savings in milk cooling.
- Although VSD technology is commonly used in large dairies overseas (that have long milking periods) they are not yet common here. Most equipment suppliers can supply variable speeds drives.

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Solar Water heating

The rebate on solar units and heat pumps represent genuine saving. However, accurate information and accounting for all the variables can be difficult. Below are some pros and cons to consider;

- Heat pumps require relative humidity to function effectively and would need to be located in a tropical area to be more efficient than solar.
- Flat panel solar units are more efficient but have higher installation costs.
- Typically it is easier to install a heat pump than a solar unit and you don't generally require multiple people & an electrical tradesman to complete the job. This tends to be why 'One man band plumbers' recommend heat pumps or small instantaneous units.
- Evacuated tubes are even more efficient than flat panel solar units although they need a method for shading or dumping excess heat/hot water in summer as they tend to boil the water.
- Be clear if your solar unit uses additional pumps to move the water as this requires additional energy.

Solar Cooling

Solar cooling is more common in Europe and has shown some promising results in Australia. Sustainability Victoria recently investigated opportunities for more sustainable methods of refrigeration systems on dairy and fruit farms in Victoria.

GenesisNow undertook some of the work on behalf of Sustainability Victoria. The report is available on the sustainability Victoria web site.

For more technical information on Solar Cooling visit the website of the [Australian Solar Cooling Interest Group](http://ausscig.org.au) (ausscig)

Did you know?

- **A warm water first wash in the vat does 90% of the cleaning by dissolving milk fats.**
- Most farms use far more energy than they need and many could save at least half their energy use
- Some farmers use four times the energy that others use to harvest the same amount of milk.
- **Water heating and cooling account for 80% of energy used in the dairy.**
- To raise 1 Litre of Water 1°C Requires 4.187 kJ of Energy

Based on research conducted for SEAV/Bonlac

Further Information:

www.cowtime.com.au
www.genesusnow.com.au
www.energymatters.com.au
www.sustainability.vic.gov.au
www.ausscig.com.au

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