

Green Cleaning

Green Cleaning

Energy & Water Savings in Cow Shed

Key Points

- Green Cleaning™ is a new system to clean milking machines that saves energy, water and chemicals.
- Steve Ronalds is one of the first farmers in the world to have a commercial Green Cleaning™ system installed at his Jindivick farm (operated by Dairy Cropping Australia)
- Early tests indicate savings in electricity for heating water of 74%, water savings of 42% and an estimated reduction in greenhouse gas emissions of 44T annually (equal to removing 10 cars from Victorian roads).
- Steve is expecting for the unit to pay for itself in about eight years, but with rising power costs and further refinements to the system, this pay back period could be reduced.



Snapshot of Steve Ronalds

Steve Ronalds, together with business partner Andrew Ronalds operate two dairy farms at Jindivick in West Gippsland (their business is Dairy Cropping Australia).

Steve has been farming for nearly 20 years and is the fourth generation farmer on the 140 hectare farm he and Andrew lease from his parents.

The split calving herd of 70% Jersey cows and 30% Holstein cows peaks at 400 milkers.

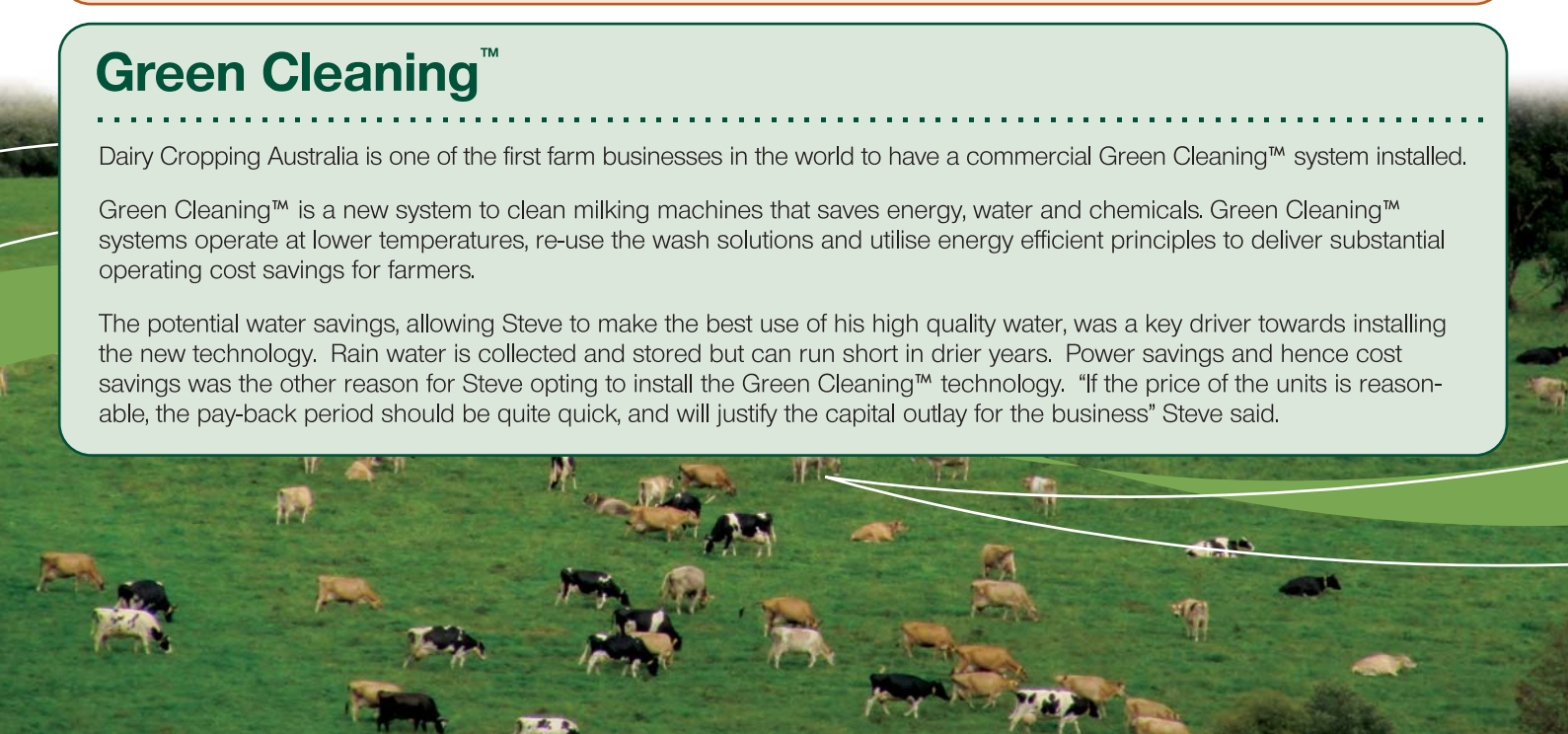
The recently built cow shed is a herringbone 20 aside double-up with rapid exit gates.

Green Cleaning™

Dairy Cropping Australia is one of the first farm businesses in the world to have a commercial Green Cleaning™ system installed.

Green Cleaning™ is a new system to clean milking machines that saves energy, water and chemicals. Green Cleaning™ systems operate at lower temperatures, re-use the wash solutions and utilise energy efficient principles to deliver substantial operating cost savings for farmers.

The potential water savings, allowing Steve to make the best use of his high quality water, was a key driver towards installing the new technology. Rain water is collected and stored but can run short in drier years. Power savings and hence cost savings was the other reason for Steve opting to install the Green Cleaning™ technology. "If the price of the units is reasonable, the pay-back period should be quite quick, and will justify the capital outlay for the business" Steve said.



More about the Ronald's Green Cleaning™ installation

System features

The fully automated system at the Jindivick farm was supplied by GEA Farm Technologies (Westfalia) and was commissioned in February 2011. The system comprises of three purpose-built, fully insulated 750L plastic storage tanks to separately store the rinse water, alkaline detergent and the acid sanitizer solutions. A controller, chemical dosing system, water supply and pipework to connect the tanks to the wash line are the other components seen in Figure 1 (Right).

The system uses a heat recovery unit and is designed to utilise waste heat from the refrigeration system. The heat is recovered in a separate 450L tank (not shown) which can heat water to around 50°C during each milking. This water is used as source water for the rinse tank, to re-circulate and heat the stored alkaline solution, and to top up the hot water service.

Green Cleaning™ systems operate at much lower temperatures than conventional hot wash systems. Steve's primary source of water heating for machine cleaning is the heat re-capture unit, with the conventional hot water service available for back-up if required. Excellent insulation and energy efficient design minimises standing heat losses.

The detergent concentrations are automatically monitored and the tanks are dosed with chemicals and topped up with rain water as required. The chemicals being used in Steve's system are supplied by Cleantec - a division of Ecolab. The system only requires a small daily volume (~ 700-800 L/day) of good quality, clean water for the pre-rinse and to top-up the cleaning solutions.

Performance so far

Although it is still early days as far as the installation goes, a recent analysis has revealed that the amount of electricity used for heating water has been reduced by 74% (88kWh daily). Further savings are expected as the chemicals being used in his system are fine-tuned.

Steve has also noticed a significant reduction in the time that it takes to cool his milk since the system was installed. On hotter days the cooling time is being reduced from 1.5 hours to around an hour. This 'bonus' saving is being delivered by the heat recovery unit (on the refrigeration system) and will be quantified in the near future.

So far the volume of water Steve uses for cleaning the plant has been reduced by 42%, saving the farm 0.33ML of good quality water per year.

Greenhouse gas emissions will be reduced in line with the energy savings. The emissions savings from heating water are around 141kg CO₂-e per day alone, which is equivalent to removing 10 cars off Victorian roads. Over a full year this would reduce the farm's emissions by 44 tCO₂-e.

Steve and his milk company rep Dale Lang, from United Dairy Power, have been keeping a close eye on milk quality during the start up phase. Although some adjustments are still being made to the chemicals, the plant has been cleaning well and the milk quality has remained in the premium band. This is expected, as the system uses a consistent regime - warm rinse, warm alkali detergent, intermediate warm rinse and then warm sanitiser - after every milking.

Almost every aspect of the system's performance is logged so can be checked either remotely or at the dairy computer. The information is extremely useful for tracking the savings and for diagnosing problems if they arise.

Expected Savings

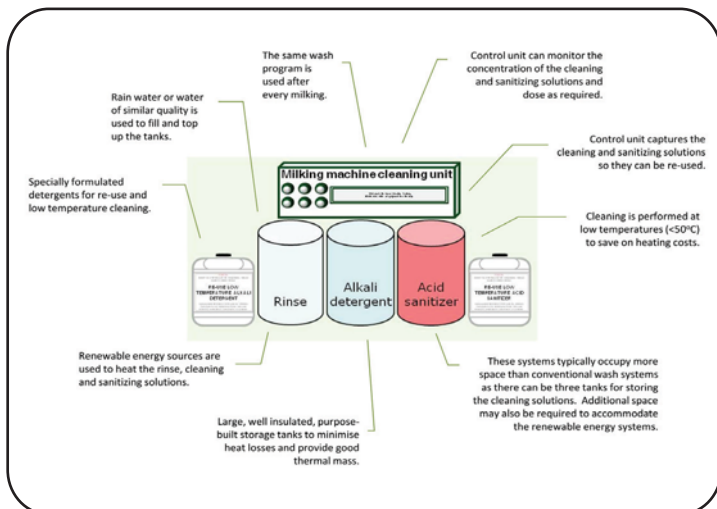
At current electricity prices, Steve and Dairy Cropping Australia expect to save about \$3,200 per year in the cost of heating water alone. The expected savings from reducing water & chemical use, and the savings in milk cooling, are still being calculated. Steve estimates that the unit will pay for itself in about eight years, but with rising power costs and further refinements to the system, this could be much sooner.

Response to climate change

Steve sees Green Cleaning™ as just one of range of things farmers can do to reduce their environmental impact. Although the reductions in green house gas emissions may be relatively small in comparison with the emissions from livestock, the savings are significant, and importantly save money.

With increasing electricity prices and inconsistent water availability through the seasons this technology makes sense. Dairy Cropping Australia is always looking to make savings where we can and improve overall business efficiency, said Steve.

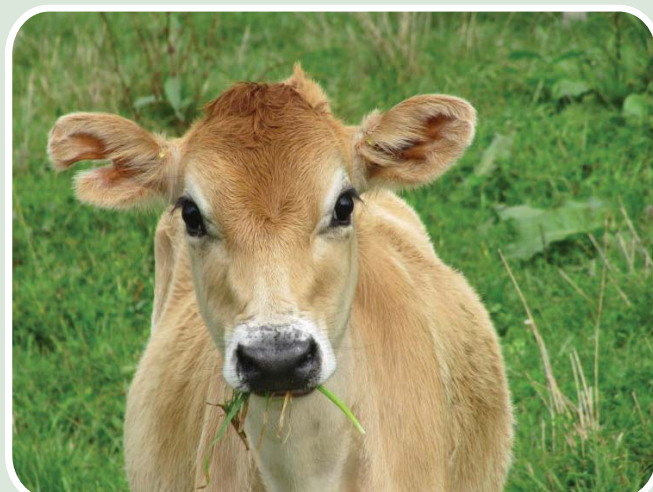




The Green Cleaning Project

The Green Cleaning project is principally funded by the Victorian Government's Sustainability Fund and the Gardiner Foundation. The project is being led by GippsDairy, under the direction of an industry Management Committee.

AgVet Projects is responsible for the management and delivery of the project. The project's industry partners include the main suppliers of dairy equipment and dairy chemicals in Australia: Cleantec - a division of Ecolab, DairyMaster, Daviesway/DASCO, DeLaval, GEA Farm Technologies (WestfaliaSurge), Milka-Ware and Tasman Chemicals. Using the findings from the project as a guide, these companies will be developing their own proprietary systems for the market place.



Managing the variable climate

Although the farm is located in a 'safe' area where the long term average rainfall is 1000 mm, Steve notes that "In the last few years the average was more like 700mm, and the last 12 months was 1100 mm."

The farm was very close to being affected in the 2009 Black Saturday bush fires which saw neighbouring farms burnt out.

"We have mixed soil and land types here which allow us to manage through the wet winters and dry summers" said Steve. "The flats are often too wet for winter grazing and in some years it is common not to be able to graze them in the late Winter and early Spring months. The undulating areas with red free draining soils are useful for the wetter winter periods. In the drier summer periods, the flats come into use as pastures persist longer with good soil moisture reserves."

Revegetation

As a member of the Jindivick Landcare Group, Steve estimates that he has planted up to 6 hectares of trees & shrubs across the farm. Most paddocks have trees, specifically planted for stock shade and shelter. All creeks running through the property are fenced and revegetated enhancing biodiversity and water quality on the farm.

Importantly, remnant bush has been fenced off to protect it from grazing. Remnant areas include *Eucalyptus Strzleckii* (Strzlecki gum) which is listed as nationally vulnerable to extinction. This species has also been used extensively in Steve's plantings.

"If the price of the units is reasonable, the pay-back period should be quite quick, and will justify the capital outlay for the business"

This case study was prepared by Robert Greenall & Gabriel Hakim of AgVet Projects together with Gillian Hayman, Dairying for Tomorrow Coordinator Gippsland. It was prepared for the Future Ready Dairy Systems project funded by The Australian Department of Agriculture Forestry & Fisheries and Dairy Australia. March 2011

Frequently Asked Questions

What are Green Cleaning™ systems?

Green Cleaning™ systems are milking machine wash systems that operate at low temperatures, re-use the cleaning solutions and are energy efficient. They are quite different from the conventional wash systems seen currently on most Australian dairy farms.

Can I wash my vat with a Green Cleaning™ system?

Although the Green Cleaning™ process may eventually be applied to clean vats, current Green Cleaning™ systems are only designed to wash milking machines.

What are the cost savings from a Green Cleaning™ system?

The savings will depend on your particular situation: your current wash regime, the type of Green Cleaning™ system to be installed and the size of your dairy. Visit www.agvetprojects.com.au/greencleaning and look for the economics calculator to get an indication of the cost savings you could achieve, or ask your local dairy equipment or dairy detergent supplier.

Do you need to periodically do a hot wash or “bomb” clean?

No. Additional cleaning and/or sanitizing measures are not required if the cleaning system is set up correctly. An effective cleaning system relies on the right chemicals used at the right temperature and concentration, in suitable quality water, being delivered into a correctly maintained and functioning milking machine. Poor dairy hygiene occurs when one or more of these elements is compromised.

Is milk quality compromised?

No. During the 15 month trial, excellent milk quality was maintained.

Isn't sanitizing with hot water cheaper than using a chemical sanitizer?

Not necessarily. Using hot water (~85°C) to sanitise is still cheaper in conventional wash systems where the sanitizer is only used once before being discarded. In re-use systems, chemical sanitizing can be 30-80% cheaper than using hot water. To compare the cost differences for your dairy visit www.agvetprojects.com.au/greencleaning and look for the sanitizer calculator.

How much energy will a Green Cleaning™ system save?

This will depend on your current energy use and the characteristics of the Green Cleaning™ system you install. The Green Cleaning™ system still requires the alkali wash solution to be heated to around 45-50°C, but this can be achieved by using solar or waste heat streams from the dairy. On the trial farm which was a 32 unit herringbone dairy, the electricity used for heating water was reduced by more than 75% (around 90 kWh per day). An additional 7-16 kWh was saved in summer by using solar to heat the cleaning solutions stored in the tanks.

How much does a Green Cleaning™ system cost?

The price of these systems will vary between suppliers. They are more expensive than conventional automatic wash systems but offer huge savings in operating costs.

How often do I need to change the re-used cleaning solutions?

This depends on the chemicals used, the quality of the water and how the system is set up. Small losses of solutions are inevitable after each use so the tanks need topping up every day or two. On the trial farm there was no need to completely refill the tanks.

Is there a build up in the cleaning solution tanks?

No. On the farm where the trial was conducted there was no build up at the bottom of the tanks after 15 months of use. This farm used good quality (rain) water.

Is my milking machine suitable for a Green Cleaning™ system?

A Green Cleaning™ system will work with most milking machines. Consideration must be given to how a Green Cleaning™ system will interface with existing equipment in dairies that are highly automated. Consult your dairy equipment supplier to explore how this may be achieved. Milking machines must drain well for chemical re-use systems to operate effectively. Poor drainage will result in cross contamination of wash solutions and greater wastage of water and chemicals. Milking machines that have hygiene issues when washed with conventional 'hot wash' systems are unlikely to be good candidates for Green Cleaning™. Underlying cleaning issues need to be sorted out prior to changing them over.

Can I use my existing chemicals in a Green Cleaning™ system?

Many of the dairy cleansers and sanitisers on the market today are not designed to work at low temperatures or in re-use systems. The chemical manufacturer should be able to tell you whether the chemicals you currently use are suitable, and/or suggest suitable alternatives.

How much room does a Green Cleaning™ system require?

This will depend on the type of system being installed. Typically there are three large tanks for storing the cleaning solutions (you may only use one on your current wash system) plus additional valves and pipes. Additional consideration must also be given to any (optional) associated equipment being installed such as solar hot water systems and heat recovery units.

Can I adapt my existing wash system for Green Cleaning™?

It really depends on what your wash system can do now and how many of the Green Cleaning™ features you wish to adopt. Consult your dairy equipment supplier to explore what is possible.

Do I need to make changes to my farm's Food Safety Plan?

Over time new chemicals, specifically designed and approved for re-use situations will become available. Until this time the farm's Food Safety Plan (QA program) may need to be amended to allow specific chemicals to be used in Green Cleaning™ systems. This applies to the 'off-label' use of registered chemicals and the use of 'un-registered' chemicals, even though this use might be allowed under a permit issued by the Australian Pesticides and Veterinary Medicines Authority.

The supplier of the chemical can give you more information about the chemical being used, and your milk factory representative can help you apply for a change to your Food Safety Plan if it is needed. Dairy Food Safety Victoria regulates farm Food Safety Plans and it is a simple matter to apply to them for a change. There is no cost and forms are available from the chemical provider.

Farmers are advised to ensure their milk company representative is comfortable that the regulatory requirements have been met prior to commissioning their Green Cleaning™ system.

When will Green Cleaning™ systems be available?

Commercial systems offering low temperature, re-use and energy efficient cleaning will progressively become available from early 2011. They will vary in the way they operate, and in the features and savings they offer. Contact your dairy equipment or dairy detergent supplier for more information.

Further information about Green Cleaning™ systems and links to the various suppliers is available at www.agvetprojects.com.au/greencleaning or contact the **AgVet office in Warragul 03 5611 1020**.