Green Cleaning™ Systems

low temperature • re-use • energy efficient

Fact Sheet #5. Summary report – On farm trial

A 'Green Cleaning™' trial unit was designed, installed and operated on a commercial dairy farm in Gippsland between March 2009 and June 2010. The trial was conducted to determine if a low temperature, re-use system could be used successfully to clean the milking plant.

A range of different chemicals and operating parameters were trialled on behalf of our Industry Partners through the fully automated Green Cleaning trial unit. During this time a large quantity of data was collected from sensors and by logging the computerised control system. Physical inspections were carried out periodically to verify cleanliness of the milking plant and supported the excellent (factory) milk quality results seen over the trial period.

Analysis of the data showed a:

- Greater than 75% reduction in electricity used for heating water for cleaning the milking machine;
- Greater than 65% reduction in electricity costs associated with heating water for cleaning the milking machine;
- A 63% reduction in water used in cleaning the milking machine; and
- A 10-30% reduction in chemical use.

The full report of the trial[1] is available from AgVet Projects on request.

The unit

The trial unit comprised a system controller and software, three 600L storage tanks, heating elements, valves, sensors and pipe work to connect the unit to the milking machine wash lines. The trial unit was also linked to a separate commercial solar hot water storage system for its source of renewable energy.

Energy efficient principles were applied in all aspects of the design with the major energy savings coming from the low operating temperatures (35-50°C); capturing, storing and re-using the warm chemical solutions; and excellent insulation to reduce standing heat losses.

Renewable energy from the solar system was utilised to heat the chemical solutions, further reducing power consumption during summer by between 6 and 15%.

[1] The development and 'proof of concept' trialling of a low temperature re-use system (Green Cleaning System) to clean milking machines on a commercial dairy farm in Victoria. AgVet Projects (July 2010). PO Box 1390, Warragul Victoria, 3820, AUSTRALIA. www.agvetprojects.com.au

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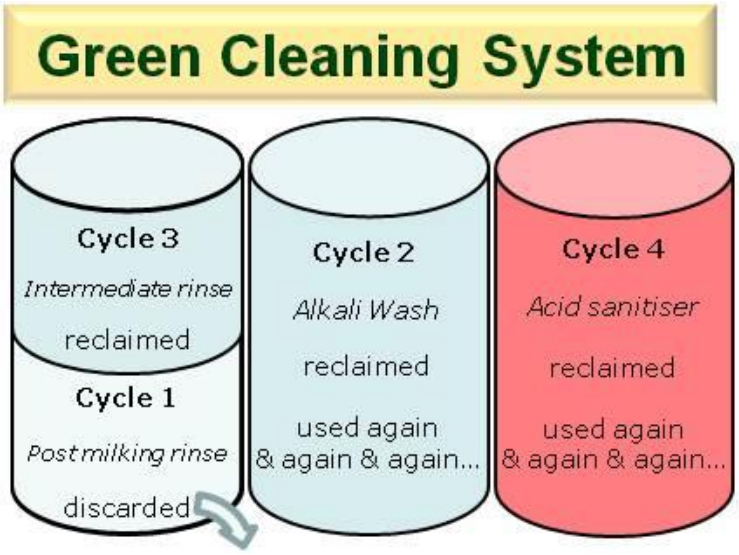
Rain water was used to fill and top up the tanks and ensured variable water quality did not influence cleaning performance. A conductivity sensor located in the wash return pipe monitored the chemical concentrations of the wash solutions. The stored wash solutions were automatically dosed with chemical to keep the solutions within the concentration range specified by the chemical supplier.

The trial unit was installed on a 300 cow commercial dairy farm near Yarragon in Gippsland. It was situated in the milk room, in parallel with the existing milking machine cleaning system so the farmer could revert to his original 'hot wash' cleaning system with ease if required.

Green Cleaning System
Uses low temperature cleaning solutions
Uses chemicals to sanitise
Used again and again and again...
Low water use
The same chemical wash cycles am/pm
Low heat losses
Low electricity use
Use detergents designed for low temperature, re-use



Operation

The Green Cleaning trial unit used three programs; milking, heating and washing. The wash program controlled the equipment associated with the cleaning process; delivering a four-cycle wash regime after each milking:

- Warm pre-rinse (30-32°C);
- Warm alkali wash (40-50°C);
- Warm intermediate rinse (30-32°C);
- Warm/cold acid sanitiser (20-50°C).

Four commercial dairy chemical manufacturers formulated chemicals and tested them through the trial unit. The operating concentrations, cycle times and temperatures were varied according to the manufacturers' instructions. These unregistered chemicals were used under a permit issued by the APVMA. The farm also had approval from their milk factory and Dairy Food Safety Victoria to participate in the trial.

Sensors in various parts of the system continuously logged data which was analysed to determine energy, water and chemical use. The milk factory was asked to increase the frequency of milk quality sampling to daily testing. Milking machine cleanliness was assessed using regular visual inspections and by monitoring the milk quality test results undertaken by the milk factory.

What we found

This 'proof of concept' trial demonstrated that it is possible to successfully clean milking machines using low temperature, re-use cleaning systems.

The cleanliness of the plant was generally very good but modifications of some existing chemical formulations were necessary to achieve consistent results. Bacterial levels in milk (TPC, thermoduric and thermophiles) were well within the 'premium' milk levels.

Daily electricity consumption (for heating) was estimated from analysing cleaning solution temperature losses from sensors located in the storage tanks as well as the total time that the electrical heating elements were switched on in the storage tanks. Electricity use averaged 24 kWh per day over the trial period excluding renewable energy. These figures were compared to the original 3 cycle cleaning regime that used 1,350L of hot water daily (heated to 90°C), consuming an estimated 113kWh per day.

The farm's original cleaning system used off-peak power to heat water at 12.23 cents per kWh. The Green Cleaning trial unit used a mixture of peak and off-peak power, so the annual cost savings of around 65% were slightly less than the 75% savings in electricity use.

We found that approximately 60-70% of the water used by the Green Clean system was captured and re-used each day. However this included tapping off wash solutions to clean test buckets and for other uses in the dairy. Chemical savings were much less at 10-30%, and depend largely on the operating parameters stipulated by the chemical manufacturers. We expect larger savings in chemical use as the Industry Partners develop their products further.

Where to from here

A number of the Green Cleaning project's Industry Partners [Cleantec – A division of EcoLab, Milka-Ware, Tasman Chemicals and GEA Farm Technologies (Westfalia Surge)] commercialised systems in mid-2011. Three of these companies currently have systems operating on commercial farms in Victoria and are collecting data to validate the trial results.

More information about how Green Cleaning™ systems work on commercial dairy farms will become available as more systems are installed.

Further information

Contact your local milking machine equipment or dairy detergent supplier for more information. Also refer to the following fact sheets about Green Cleaning™.

Green Cleaning™ Fact Sheet #1. What are Green Cleaning™ systems?
Green Cleaning™ Fact Sheet #2. Green Cleaning™ systems – a closer look
Green Cleaning™ Fact Sheet #3. Frequently asked questions
Green Cleaning™ Fact Sheet #4. Economics of Green Cleaning™ systems
Green Cleaning™ Fact Sheet #6. The total costs of milking machine cleaning

More information is available at www.agvetprojects.com.au/greencleaning.

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