

Green Cleaning Systems™

low temperature ♦ re-use ♦ energy efficient

Fact Sheet #4. Economics of Green Cleaning™ systems

Keen to reduce operating costs? Want to reduce water use and lower greenhouse gas emissions as part of the bargain?

You can achieve these objectives by installing a Green Cleaning™ system. The table below lists the features to look for in a Green Cleaning™ system. The more features the greater the savings in energy, water & chemicals.

What features should I look for?

Include this feature...	Because...
Chemical solutions used at low temperatures	The less heating required the less cost. Some systems use specially formulated alkali detergents at temperatures of between 30-50°C. Also look for systems that use acid sanitizers at ambient temperature.
Re-use	Re-use is an integral part of a Green Cleaning system. It saves on heating, chemicals and water. Re-use can save as much as 60% of the water needed for cleaning.
Well insulated tanks	Minimising heat losses from tanks will reduce heating requirements and therefore, costs. Purpose-built insulated tanks offer the best insulating properties.
Large tank volumes	Having sufficient tank volume (~600 L for dairies up to 50 units) provides good thermal mass. This means that the temperatures of the solutions are maintained during the cleaning cycle, improving cleaning performance.
Warm pre-rinse	Using a warm – rather than cold – pre-rinse does a better job at rinsing the milking machine. It also reduces temperature losses in the next cycle. Pre-rinse water can be heated from the plant's heat exchanger.
Low refill requirements	This saves water and chemicals. This can be achieved by good design which maximises plant drainage and recovery of the cleaning solutions.
Renewable energy sources	Energy costs are rising. Using renewable energy sources to heat the rinse, cleaning and sanitizing solutions makes economic sense. Examples include solar HW, refrigeration heat recovery units, and plate cooler heat re-capture. Lower energy use means lower greenhouse gas emissions, especially when renewable energy sources are used.
In-line monitoring of chemical concentrations	It ensures that the chemical concentrations of the cleaning and sanitizing solutions remain in the range specified by the manufacturer.
Auto dosing of chemical	It reduces the need for handling chemicals.
System performance reports	Creating an electronic record of the cleaning system's performance (temperature of solution, amount of chemical added, etc) can assist you to comply with factory quality assurance requirements.

How much could I save?

By installing a Green Cleaning™ system that includes all of the features mentioned on the previous page substantial savings in energy can be made. Use the table below as a guide to the potential savings you could make.

Conventional wash system		Green Cleaning™ system			
Volume per cycle	Estimated total power use for heating water per day 3 cycles per wash: warm pre-rinse, hot wash, hot sanitizing rinse. 2 washes per day.	Potential savings per day if system uses heated acid sanitizer		Potential savings per day if system uses unheated acid sanitizer	
Litres	kWh	kWh	%	kWh	%
140	54.9	26.9	49%	40.9	75%
160	62.8	34.8	55%	48.8	78%
180	70.6	42.6	60%	56.6	80%
200	78.5	50.5	64%	64.5	82%
220	86.3	58.3	68%	72.3	84%
240	94.2	66.2	70%	80.2	85%
260	102.0	74.0	73%	88.0	86%
280	109.9	81.9	75%	95.9	87%
300	117.7	89.7	76%	103.7	88%
320	125.6	97.6	78%	111.6	89%
340	133.4	105.4	79%	119.4	90%
360	141.3	113.3	80%	127.3	90%
380	149.1	121.1	81%	135.1	91%
400	157.0	117.0	75%	129.0	82%
420	164.8	124.8	76%	136.8	83%
440	172.7	132.7	77%	144.7	84%
460	180.5	140.5	78%	152.5	84%
480	188.4	148.4	79%	160.4	85%
500	196.2	156.2	80%	168.2	86%
520	204.1	164.1	80%	176.1	86%
540	211.9	171.9	81%	183.9	87%
560	219.8	179.8	82%	191.8	87%
580	227.6	187.6	82%	199.6	88%
600	235.5	195.5	83%	207.5	88%

The information in this table should be used as a guide only. Individual circumstances and the types of systems installed will alter the figures. These figures are based on the data obtained from the Green Cleaning trial site. Consult your dairy equipment or detergent supplier to find out savings specific to your situation.

A. Select the volume of water that is used for each cycle.

B. This is how much power is used to heat water for cleaning.

C. Select whether the wash program will heat the acid sanitizer or not.

D. This is how much power can be saved per day.

Example

A farm has a conventional milking machine cleaning system that uses the following wash program.

	AM	PM
Cycle 1:	Warm rinse (300 L)	Warm rinse (300 L)
Cycle 2:	Hot alkali wash (300 L)	Hot acid wash (300 L)
Cycle 3:	Hot water final rinse (300 L)	Hot water final rinse (300 L)

The volume of each cycle in the wash program is 300 litres. The dairy milks for 320 days a year and the dairy's off-peak electricity tariff rate is 14 cents/kWh.

Using the table:

- A. In the first column select volume used per cycle, in this case 300.
- B. Column 2 estimates total power used for heating is 117.7 kWh per day.
- C. Select the type of Green Cleaning™ system to be installed, in this case, one that uses acid sanitizer that is not heated (i.e. used at ambient temperature).
- D. The potential daily saving is 89.7 kWh (28,704 kWh per year).
Then the cost saving is $103.7 \times \$0.14$ (off-peak tariff rate) = **\$14.52 per day**
or \$4,646 per year ($\14.52×320).

If the dairy’s electricity supply is generated in Victoria from non-renewable resources, this represents **annual greenhouse gas reduction of 40 tonnesCO_{2-e}**.

Calculators are available to help crunch the numbers

There is a sanitizer calculator and an economics calculator available for those who wish to do a more detailed assessment of the likely savings from installing a Green Cleaning™ system.

The sanitizer calculator compares the costs of using hot water as a sanitizer (conventional system) with a chemical sanitizer in a Green Cleaning™ system.

You’ll need to provide details about the chemical sanitizer and your electricity tariff rates. The calculator then estimates the costs per wash, per day and per year for the two ways of sanitizing your milking machine.

Green Cleaning Sanitizer Calculator

Hot water sanitizing vs Chemical sanitizing in a re-use system

Farm name
 Date

Enter your information here

Chemical sanitizer concentrate cost	7.3	\$/L
Chemical sanitizer dilution rate	20	ml/10 L
Sanitizer cycle wash volume	300	L
Sanitizing cycles per day	2	cycles
Days of milking each year	330	days
Daily chemical replenishment rate (re-use system)	10	%
Off-peak tariff rate	12.23	cents/kWh
Peak tariff rate	21.31	cents/kWh

Is pre-heated water used to feed the HWS? Yes, No

What is the total volume of heated water that can be supplied to the HWS?

What is the average temperature of the cold water entering the pre-heater? °C

What temperature is the hot water service thermostat set to? °C

Does the chemical sanitizer need heating? Yes, No

Your Results

	Per wash	Per day	Per year
Cost of chemical sanitizing cycle \$	\$	\$	\$
Cost of heating chemical sanitizer \$	\$	\$	\$
Total cost of chemical sanitizing cycle in a re-use system \$	\$	\$	\$
Please note these are estimates only			
Cost of hot water sanitizing cycle \$	\$	\$	\$

The economics calculator provides greater analysis on installing a Green Cleaning™ system.

It will ask for specific details of your current wash routine and provide an estimate of the costs associated with heating water.

It will then provide estimates on operating cost savings and even work out payback periods for two different levels of investment.

It also estimates the likely savings in greenhouse gas emissions.

Both calculators can be found at www.agvetprojects.com.au/greencleaning

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 #5. Summary report – On farm trial
- Green Cleaning™ Fact Sheet #6. The total costs of milking machine cleaning

The fact sheets along with more information are available at www.agvetprojects.com.au/greencleaning