



# Vat cleaning systems

## 1. Introduction

Udder health, milking system cleanliness (including the vat, or bulk milk tank), and good milking practices are key factors in the production of quality milk. Cleaning systems for dairy equipment aim to remove ALL of the milk residues from the plant and destroy any bacteria that may be resident on the surfaces.

## 2. Interpretation and relevance to Australian conditions

The quality of raw milk, when it leaves the farm gate, sets the ceiling on the quality of dairy foods because the by-products of bacterial activity have already contaminated the milk. Improving milk quality on-farm increases the yield and quality of dairy products and potentially increases returns to all dairy farmers. The consistent use of a vat cleaning routine that is tailored to the vat size, configuration and other available resources (water volume and quality) will minimize the need to climb inside the vat and manually scrub the surfaces. Automation of vat cleaning enables the vat to be cleaned immediately after emptying, reducing the risk of milk residues setting on the vat surfaces and hence limiting the opportunity for bacterial growth.

## 3. Relationship to CowTime goals

The CowTime project aims to save time and effort in milk harvesting. Automation of vat cleaning offers great potential for labour saving and safety. Reducing the labour time required for vat cleaning while maintaining the quality of the job is possible on many farms. Effective vat cleaning helps maintain milk quality and maintain returns. Automation of the cleaning process provides consistency of operation and eliminates human error while limiting Occupation Health and Safety issues associated with handling strong chemicals, hot water or entering confined spaces.

## 4. Features of vat cleaning

### Cleaning sequence

The ideal vat cleaning sequence consists of an immediate cold rinse, then a subsequent warming rinse followed by a hot detergent wash, a cooling rinse and a sanitising rinse.

**Cold Rinse:** This is the most important step in the whole cleaning process. After the vat has been emptied, the tank should be rinsed with a hose using cold water, with the vat outlet fully open to allow any accumulated froth to be washed away.

**Warming Rinse:** After the vat has been cold rinsed, it should be further rinsed with warm water (40°C). This has the threefold effect of further rinsing milk residues from the vat, warming the internal surfaces to minimise the sudden expansion of the vat surfaces when the hot wash water is introduced and also to minimise the temperature loss when the wash water is introduced.

**Hot Detergent Wash:** To avoid structural damage to "older" bulk milk tanks, the temperature of the hot wash should be less than 70°C. At this temperature fat deposits are not as soluble as at higher temperatures and therefore more consistent use of alkaline chemicals is required to remove fat deposits. Specially formulated bulk tank cleaning chemicals, designed to perform at these lower temperatures, should be used. Most bulk milk tanks built since about 1995 have been made with improved manufacturing techniques. They are fitted with more sophisticated compressor systems and are less prone to structural damage from use of water in excess of 70°C. Check with the manufacturer.

**Cooling Rinse:** The purpose of the cooling rinse is to flush residual wash chemicals (typically alkaline chemicals) from the vat before the introduction of the sanitising (typically acid sanitisers) rinse. This minimises the potential for chemical reactions. The cooling rinse should be at 35 – 40°C to reduce the temperature of the internal surfaces more gradually.

**Sanitising Rinse:** The final rinse with cold water and cold water sanitisers further cools the vat and sanitises the internal surfaces. Cooling the vat at the end of the wash cycle is important because milking often commences soon after the completion of the vat wash cycle. Introducing milk into a vat with an elevated surface temperature can encourage the growth of thermophilic bacteria.

Different methods of cleaning the vat require varying labour inputs and offer varying scope for automation.

### Manual cleaning systems

Usually limited to small tanks (less than 2500 litres) with good access to all internal surfaces

#### **Advantages:**

Inexpensive to establish.

Effective results if done properly.

#### **Disadvantages:**

High labour cost (if done properly).

Danger due to lifting buckets of hot water and detergent to empty into tank. Protective clothing should be worn when manually washing bulk tanks.

Prone to short cuts due to time taken to do the job correctly.

High detergent cost due to a tendency to be 'heavy handed'.

Tendency to use hot water directly from dairy hot water heater – too hot.

Areas of the bulk tank are easily missed – under bridge, dipstick, agitators and corners.

### Manual spray cleaning

Manual spray cleaning involves the installation of a spray ball or similar device into the top of the vat. The spray ball rotates under water pressure to distribute the cleaning solutions to all of the internal surfaces. Pump sizes, spray ball design and water volumes need to be matched to provide adequate cleaning.

#### **Advantages:**

Can be retro fitted to most bulk tanks.

Relatively inexpensive to install - typically \$1000 - \$2000.

System can be shared between a number of tanks.

#### **Disadvantages:**

Unless automated to some extent, manual spray cleaning does not save much more time than manual cleaning.

Chemicals need to be manually dosed (wear gloves and goggles when handling chemicals).

Tendency to use hot water directly from dairy hot water heater which is too hot.

Spray balls can block, resulting in areas of the tank not being cleaned.

Limited contact time of detergents if the water is not recirculated.

System can be started with milk still in the tank.

### Fully automatic cleaning

Most new bulk milk tanks are being installed with fully automatic, integrated washing and cooling controllers.

#### **Advantages:**

Wash cycles can be tailored to suit size and configuration of tank and local resources.

Repeatable and consistent wash cycles.

Error and fault reporting.

Integrated with cooling systems.

Usually supplied with dedicated hot water service.

Minimal handling of chemicals.

Required volumes of water and chemicals are reduced by recirculation.

Tank can be completely washed immediately after emptying.

Little labour input.

#### **Disadvantages:**

Wash times can be excessive (outside milk processor requirements) if the water pressure is low.

Spray balls can block, resulting in areas of the tank not being cleaned.

Expensive – typically \$2000 more than a manual spray system.

Often only available as an integral part of the bulk tank.

No system is fully automatic – chemical drums and effectiveness of wash program need to be monitored.

### Cost/benefit summary of vat cleaning systems

CRITERIA	MANUAL CLEANING	MANUAL SPRAY CLEANING	FULLY AUTOMATIC
Establishment Cost	***	**	*
Labour Cost	*	**	***
Chemical Cost	**	**	***
Water Use	***	**	*
Hot Water Cost	**	**	**
Safety	*	*	***
Ability to automate	N/A	***	***
Effectiveness of cleaning	**	**	**

\*The more stars the better.

## 5. Potential challenges with implementation

Effective bulk tank cleaning routines require the use of concentrated chemicals and/or large volumes of hot water. Occupational Health and Safety issues arise from this practice. Many vats are 'confined spaces' and entering them can have fatal consequences from asphyxiation.

## 6. Robustness of this information

The information is based upon observations compiled from over 3000 farm visits Australia wide by Dasco dairy hygiene specialists. Observations cover a wide range of circumstances including tank size, water source, water volume and water quality.

## 7. References and further reading

Graham Hobson, Graham Hobson Refrigeration, Personal Communication

Dasco (1996) Maintaining Dairy Hygiene, Dasco Pty. Ltd., PO Box 5031, Heidelberg Heights, 3081.

Reinemann, D.J. & Wolters, G. (2001) Review of practices for cleaning and sanitation of milking machines. Draft International Dairy Federation Bulletin, IDF.

Scott Brown, Barry Brown & Sons. Personal Communication

**CowTime Guidelines for milk harvesting** - Chapter 6, edited by Klindworth, D. et al (2003). Available on the CowTime website [www.cowtime.com.au](http://www.cowtime.com.au)

**Quick Note 3.2:** Checklist for making changes to milk harvesting infrastructure

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