The Co-operative Difference

Fonterra Dairy for life

Understanding Your Milk Cooling System Fact Sheet

Effective milk cooling is a key determinant of milk quality. The more rapidly milk is cooled, the better quality it will be when it is collected from the farm.

Understanding how milk cooling systems work will help you decide what options will best suit your situation, as there is not a 'one-size fits all' solution. You may need to seek advice from your refrigeration specialist, milking machine specialist and electrician.

Milk Vat Monitoring

Your farm will have a Milk Vat Monitoring System installed on it. This system can help you identify potential issues with your cooling system that may need addressing. The information that the system provides can help farmers and service providers to determine where these pinch points are and possible solutions.

Primary Cooler

Your primary cooler is the cheapest way to cool your milk. We recommend that you make your primary cooler as efficient as possible, even if your water source is not as cold as required, as this is a good way to save on power costs. You can ask your milking machine fitter to help optimise your primary cooling.

With an efficient plate cooler, the milk leaving the cooler should be no more than three degrees warmer than the water entering the cooler.

A primary cooler's performance can be affected by several factors.

1. Flow rate of cooling water to milk

The cooler should be sized for the peak milk flow from the milk pump. (The milk pump should go as slowly as possible during milking without flooding the plant.)

- 'M series' plate coolers work most efficiently with a water-to-milk flow ratio of 3:1. This means three litres of water must pass through the cooler for every litre of milk. For newer industrial coolers, a 2:1 ratio is adequate.
- Water flow rate can be restricted by:
- Over-compressed cooler plates. Allow about 3mm per plate
- Undersized pipe lines that connect to and from the cooler
- The pump is not large enough to provide required flow rate.

2. Temperature of the water source

The water source should be as cold as possible for water entering the plate cooler.

- Bury any water lines that come from the water source (bore, stream, and dam)
- Avoid re-circulating water from the primary plate cooler back into the same tank, as the tank water temperature will increase during milking and reduce the cooling efficiency. Water re-circulation will increase the temperature of the milk entering the vat and so the milk will need additional chilling in the vat
- Storage tanks should be positioned on the south side of the dairy, ideally in a shadow zone
- Use lighter coloured water storage tanks to minimise solar heating.

3. Number of plates

The peak flow of milk from the milk pump will determine the type (M series or industrial) and the number of plates you need. Note that you may not gain any benefit by adding more plates to a cooler without the correct water-to- milk ratio.

4. Plate cleanliness will affect performance

A cooler's capacity will be affected by contaminants (i.e. iron water) that adhere to the plates, reducing its performance.

5. Correct plumbing will help cooling performance

Water should flow in the opposite direction to the milk in the cooler. Milk will otherwise cool less efficiently and will need more cooling in the vat, incurring extra expense.

Tip **Ask your milking machine fitter to help make your primary cooling as efficient as possible.**

Boosting Your Power

If you require additional electricity for refrigeration, think about these electrical considerations:

- Is your transformer big enough to take the additional load?
- Are line sizes and pole fuses sufficient?
- Will additional line charges be incurred if you use more peak load Kw?
- Can items like effluent irrigation be locked out during milking to reduce the peak load?
- Are you limited by single-phase power?
- Think about a thermal storage solution if you require greater refrigeration and are limited by some of these factors.

Tip **Seek advice from your qualified electrician if you need to make changes, as they will need to carry out any electrical work.**

Vat Refrigeration System

The size of your vat refrigeration pad determines how many kW of heat it can remove. Once you have reached the maximum amount, you cannot increase its heat removal capacity by adding extra kW / a larger refrigeration unit.

Vat refrigeration units should only be serviced or maintained by a suitably qualified refrigeration expert. However, you can complete some simple checks to make sure that it is functioning efficiently:

- Clear any debris from the condenser / condenser fins to ensure a clear flow path for the cooling air.
- Check that cool fresh air is flowing over the condenser. You don't want the warm air from behind the refrigeration unit to reticulate back to the front of the condenser. A piece of plywood may be all it takes to prevent that occurring.

- Check how often your refrigeration unit is switching on and off once your milk reaches the desired temperature. If it is still on most of the time or constantly clicking on and off, your system may not be working efficiently, so contact your refrigeration engineer for advice.

Tip **If you are unable to meet the milk cooling standards with your vat refrigeration system, you may need to install a first-stage cooling system e.g. Ice bank, Chilled water, Glycol – refer above about possible power constraints.**

First-stage cooling system options

Ask your refrigeration providers to help make your vat refrigeration as efficient as possible. They can also recommend first stage cooling system solutions for your requirements.

There are three main types of systems:

Thermal storage - Chilled water

Thermal storage systems chill water in a large tank and reticulate it through a plate cooler after the primary cooler (you can use a double-banked cooler). Water is usually chilled to 7 – 10 degrees.

Benefit: You could use off-peak power, reducing your peak power consumption.

Thermal storage - Ice Banks

Ice banks generate ice along evaporator coils. The ice is used to chill water for the pre-cooler. The warm water is then returned from the pre-cooler to the top of the ice bank and cooled again as it runs down the ice.

Benefits: You could use off-peak power, reducing peak power consumption. Ice banks can also cool milk to lower temperatures than the chilled water system and take up less space.

Instant chilling during milking

A refrigeration system is used to cool water or food-grade glycol/water mixture. Glycol systems tend to use a small volume of fluid and create the chilled fluid on demand requiring a good power supply (at milking time).

You will need a larger compressor than other systems require.

Limited power supply in some areas may cause supply problems i.e. transformers, lines sizes, fuses etc.

Benefits: They are reasonably compact and can cool milk to lower temperatures than chilled water if desired. No energy is lost when storing a large volume of ice or chilled water.

Support

To discuss your milk cooling system, contact your Area Manager or call the Service Centre on:

0800 65 65 68