

Water Efficient Farming

How to measure water usage in the dairy

Water use at the dairy shed can be measured by a known volume of tank water or pump flow rate where these supply all water uses. If water comes from a variety of sources and to double check volumes, estimating all component uses is advised. The following notes explain how.

Tank size

Most dairies store water in a tank that is then reticulated around the dairy for a range of purposes.

Knowing the tank size and the proportion of water that is used per milking or per day and how this fluctuates throughout the season will give a good starting point to understand water usage in the dairy.

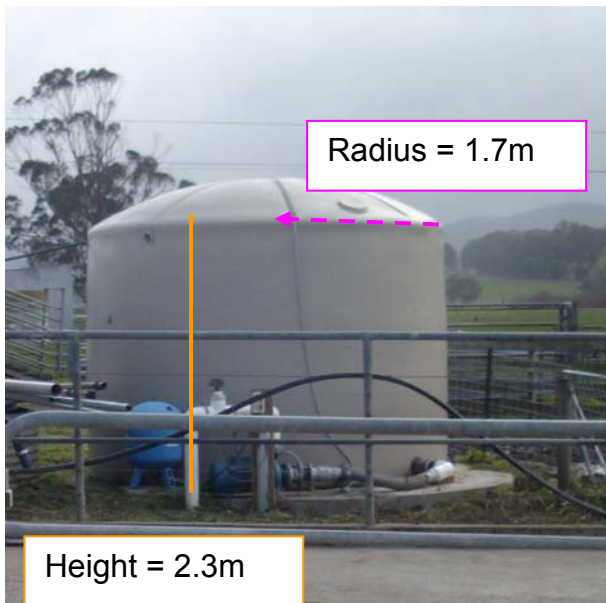
To calculate the volume of a tank:

$$\text{Volume of tank} = \pi \times \text{radius (m)}^2 \times \text{height(m)}$$

Where π (pi) = 3.14

Where r = radius (half of the diameter)

Then to convert m³ into litres multiply answer by 1000.



Example:

$$\begin{aligned} \text{Volume of tank} &= 3.14 \times (1.7)^2 \times 2.3\text{m} \\ &= 22.12 \text{ m}^3 \times 1000 = 22,118 \text{ litres} \end{aligned}$$

To convert Australia gallons to litres:

$$\begin{aligned} \text{Multiply tank size in gallons by } 4.55 \\ = \text{ litres in the tank.} \end{aligned}$$

Pump Flow Rates

Measuring flow rate from the outlet of a pump can be difficult due to accessibility. If it is possible to access an outlet pipe follow the instructions below to calculate the flow rate.

If this isn't possible, check with the manufacturer's specifications for the pump flow rate. You will also need to consider the head the pump is working at, and the amount of time the pump runs for. This will give you a rough indication of water use.

Calculating flow rates

The principles of calculating the flow rate can be applied to all uses of water in the dairy. It requires a stop watch and a bucket of known volume.

$$\begin{aligned} &\text{_____ (a) litres (volume of bucket)} \\ \div &\text{_____ (b) seconds to fill bucket} \\ = &\text{_____ (c) litres/second (rate of water used)} \end{aligned}$$

$$\text{(c) } \times 60 \text{ (seconds)} = \text{_____ (d) litres/minute flow rate}$$

$$\begin{aligned} \text{(d) } \times \text{_____ (e) minutes taken to undertake task} \\ = \text{_____ (f) litres of water used} \end{aligned}$$

Example: A farmer hoses the yard for 20 minutes a day using a 1.5 inch hose.

How much water is used?

$$\begin{aligned} 20 \text{ litre bucket takes } 10 \text{ seconds to fill } (20 \div 10) \\ = 2 \text{ litres/second or } 120 \text{ litres/min } (2 \times 60) \\ \times 20 \text{ minutes} = 2,400 \text{ litres used} \end{aligned}$$

Estimating the component uses of water in the dairy shed

Yard washing

For flood washing check the capacity of the flood wash tank. Often tanks are ~17,000 litres.

For hoses calculate the flow rate. For hydrants this may be more difficult to measure the flow rate, so it may be necessary to check the manufacturer's specifications. As a guide, yard blasters have the potential to deliver 2,000 litres per minute and mostly operate between 5 to 10 minutes each milking.

| Yard wash system | Water use per day (litres)* |
|------------------|-----------------------------|
| Hose wash | 3,000 – 12,000 |
| Hydrant wash | 2,000 – 12,000 |
| Flood wash | 15,000 – 20,000 |

* From Dairy Australia's "Water in the Dairy" information sheet. Adapted from McDonald, S. (2005) Water Use in Dairy Sheds, DPI Victoria

Pit and platform washing & teat washing

Low volume hand held hoses for washing manure off teats and a higher volume hose for washing manure off the platform are commonly used. The amount of water used can vary greatly. It can be estimated by calculating the flow rate of the various hoses and multiplied by the amount of time each hose is used for.

Cup and platform sprays

Cup and platform sprays are generally only associated with a rotary shed. An inventive way to capture the water as it comes out of the nozzle such as a funnel or wide pipe that runs into a bucket may be required to measure the flow rate. Alternatively checking the manufacturer's specifications may also provide the flow rate.

Milking machine washing

For plant rinse a general rule of thumb is 5-8 litres per cluster per cycle per milking, or check the volume of water in barrels used.

For example:

A 32 unit swing-over uses
5 litres x 32 units x 3 rinses x 2 milkings
= 960 litres / day

Vat washing

Most vats have automatic wash systems, which may make it difficult to estimate the amount of water used. For vat water use, check the manufacturer's specifications.

Plate Cooler

Substantial amounts of water are used on farms to pre-cool milk. This can be redirected to yard washing system or redirected back into a water tank or dam. Older plate cooler systems generally operate at a ratio of 3:1 of water to milk, while the ratio is 2:1 for the industrial size plate coolers. It is only necessary to estimate plate cooler water required if it's not recycled.

Other sources

Yard wetters and sprinklers can also use significant amounts of water over the warmer months. Leaking taps and hoses can also contribute to water usage. It is important to account for these uses of water when estimating water use in the dairy.

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