IN THE DAIRY

A well-designed, carefully built milking area ensures that:

- Milkers find the milking work routine easy, comfortable and safe.
- Cows enter the milking platform voluntarily and ready to milk.

An efficient, consistent milking work routine:

- saves time;
- keeps the stress level of milkers to a minimum;
- improves the litres of milk harvested per operator, per hour;
- improves cow behaviour on the platform; and
- assists in maintaining milk quality and udder health.

This chapter contains ideas to consider on the following areas.

Information in this chapter will assist in creating a comfortable milking area and the development of efficient milking work routines.

Key principles to keep in mind ...

It is important to keep key principles of cow behaviour and good facility design in mind when considering how to improve this part of the milk harvesting process.

Cow comfort

It is important to maintain high levels of cow comfort once the cows are in the milking area. This will encourage cows to enter voluntarily, aid let-down and boost productivity. Good design is the key.

- Noise should be minimised, particularly intermittent or loud noises.
- Sharp features should be minimised, to reduce the wear and tear on equipment and the potential for injury.
- Pipework should not contact 'boned' areas of the cow, especially around the hips and ribs. This is particularly important if cows are pushed up against pipework by other animals.

Each milking position should be a constant, repeatable environment for each cow, well aligned to the clusters, with protection from other cows and room to stand comfortably.

Milker comfort

It is important to make working conditions in the dairy as comfortable as possible. Again, good design is the key.

- Flooring should be non-slip, with care paid to the design of steps and the placement of drains, etc. Cushioning mats should be considered for areas where people stand for long periods.
- Equipment, operator controls and safety shut-off switches should be within easy reach of the milker's working position.
- The height of equipment and the working area should be ergonomically correct.
- The lighting of the work area needs to be sufficient to assess the conditions of teats.
- Safety guards should be fitted to all moving machinery parts and on areas where cows can cause injury to milkers.

Milking should be easy, safe and pleasant. Make milker comfort a priority.

The milking area in a dairy is a workplace containing a number of hazards. The main hazards to milkers include:

- Frightened, uncomfortable cows – these cows are unpredictable and kick and dung more often.
- Unguarded machinery – clothing, hands and hair can be caught in moving parts.
- Moving gates or feed systems – these can present serious crush hazards.

Untrained visitors and children — out

Given these hazards, it is essential that milkers and cows are the only ones present in the milking area.

Have a clear policy regarding visitors and children entering the dairy. This workplace is not a safe place for them.

Avoid rushing

Design a milking work routine that does not put too much pressure on those milking. Having enough time to complete each milking task without rushing means fewer accidents and injuries.

Reduce haste in the routine with conveniently placed operator controls.

Vary the routine for milkers in rotary dairies that are working long shifts. Avoid operator fatigue and poor concentration.

Train milking staff

Training ensures milkers know the management's expectations and can demonstrate safe milking work routines.

Inexperience or poor training often contributes to accidents. Establish clear training and operating protocols and follow them.

The milking area

Milking area working environment

Milkers are in the dairy at least twice a day – sometimes for up to six hours per day. The physical conditions of the milking area in a dairy have a major influence on the comfort of the people working in this environment.

Ventilation

Good ventilation is essential for worker health and reduces fatigue. The open designs used in modern Australian dairies are reducing the problem of hot, stuffy and dusty milking areas. There are a number of different ways to ventilate the dairy.

- In warmer regions, use fans to move the air on hot days – the moving air can also provide some relief from flies.
- Several rotary dairies have been built with a hole in the centre of the roof. Donut roofs promote good airflow up and out of the centre of the dairy. This natural airflow also helps to reduce the fly problem.
- Good airflow in the dairy helps reduce algal growth by drying floors more rapidly.

Figure 5.1: Bright, open, uncluttered dairies provide a good working environment.
Source: National Milk Harvesting Centre.

Slippery floors are a serious OH&S issue for milkers and pose a danger to cows as well.

Lighting

It is important to make use of as much natural lighting as possible. Higher roofs and open sides make a big difference to the amount of natural light in the milking area. Good lighting also helps to make the working environment safer.

- Materials such as polycarbonates can be used for skylights and clear walls – both let in more natural light.
- Clear skylights can let in too much heat if the roof is low and orientated towards the sun. The recommended illumination in the milking area is given in Table 5.1.

Table 5.1: Suggested illumination levels for dairies.

Area of milking facility	Illumination level – lux	Comparative lighting levels
General lighting	200 – 215	General home lighting
Milking pit	500 – 538	Well-lit office

Source: National Milk Harvesting Centre.

- The placement of artificial lights is important – cows do not like to walk into very bright light.
- The most efficient lamps to use are fluorescent, high-pressure sodium or metal halide.
- Energy-efficient lamps tend to have a longer life.
- Also consider the colour of the light. When trying to identify stripped milk for blood or other indications of health problems, it is useful to have as white a light as possible.
- Incandescent and halogen lamps give the whitest light. However, from an energy point of view, high-quality fluorescent or metal halide lamps are a good compromise.
- Avoid glare where possible. Mount lights above the line of sight and consider a matte finish for reflective surfaces to reduce glare for both the cow and the milker.

The milking platform and pit need to be well lit. As a general rule, illumination must be sufficient to allow milkers to assess the cleanliness of cows' teats.

Good lighting is essential for a safe working environment.

Noise

Exposure to continuous or intermittent loud noise is stressful for those working in the dairy and unexpected sound such as shouts can unsettle cows.

- Too much noise damages workers' hearing. Noisy dairies also make it harder to hear if something is going wrong.
- Ensure the vacuum pump is well insulated, to reduce noise levels at the milking platform.
- Vacuum regulators are also a source of noise.
- Where possible, eliminate the banging that may be caused by metal clashing.

The recommended noise level for a working area is less than 80 dB. Less than 60 dB is a good target. If voices need to be raised to be heard, the noise level is probably too high.

Noise levels must be below statutory limits.

The milking work routine

Routines for milking cows follow the same basic pattern all over Australia. The milking work routine is made up of 7 main tasks.

Table 5.2: Description of the milking work routine tasks.

Work routine task	Details of milker's tasks
Cow entry	Cows are let onto the milking platform. Rotary platforms are self-loading.
Feeding in the dairy	Feed is delivered to individual cows once in the bail.
Teat preparation	Teats and udders assessed and washed if necessary. Problem cows identified.
Cluster attachment	Clusters are attached and adjusted if necessary.
Cluster removal	Clusters are removed once milk flow rate diminishes.
Teat disinfection	Teats are disinfected to maintain condition and minimise mastitis.
Cow exit	Cows leave the milking position and move off the platform.
Miscellaneous	Fixing cup slips, drafting, etc.

Source: National Milk Harvesting Centre.

Each one of the tasks in a milking work routine can be streamlined to maximise labour productivity.

Appendix 2 – Working out work routine time, p 257.

Cow entry

Cows that voluntarily enter the dairy reduce the number of times the milker has to leave the pit to chase cows. Chasing cows in severely reduces labour productivity. A number of factors encourage cows to enter the dairy willingly.

- Good design encourages cows to move onto the platform.
- Good stockhandling means low levels of fear and results in better cow-flow.
- Training can help cows to learn to enter the dairy voluntarily.

Chapter 4 – Dairy entry.

Pain caused during milking makes cows less enthusiastic about entering the dairy next time. Cows will wait in the yard rather than enter the dairy if they perceive it will be a painful experience.

Feeding in the dairy

Manual feeding systems tie up milker time that could otherwise be spent on more critical teat preparation tasks.

- Individual cow manual feeding systems require 1-2 seconds per cow.
- Automation or 'one pull' per side systems can greatly reduce or eliminate this time altogether.

Behavioural problems

If feeding in the dairy becomes a part of the nutritional management of the herd, an appropriate set up for feeding needs to be considered to avoid cow-flow problems at milking.

- Use individual feed bins or dividers so that the dominant cows cannot boss other cows and try to steal their feed.
- Bossing by dominant cows causes great discomfort – younger and less dominant cows may not want to enter the dairy to be milked.
- Many farmers make up their own stall dividers and weld them in themselves (see Figure 5.2). There are more elaborate stall dividers made by a number of different companies.

Figure 5.2: An example of individual feeding bins with dividers.
Source: National Milk Harvesting Centre.

Teat preparation

Teat preparation is an essential task of the milking routine in terms of milk quality and udder health.

- Time spent preparing the cow usually results in quicker let-down and a faster, cleaner milk out.
- Time spent on teat preparation can be partially or fully offset by shorter milking times.
- Don't skimp on this element of the work routine just to save time in the dairy – preventing teats getting dirty on the way to the dairy is a more efficient way of achieving efficiency gains in this area.

Applying a consistent method when preparing teats gets cows used to the procedure and reduces kicking.

Preventing dirty teats

The need to cope with large numbers of dirty teats at milking can be both frustrating and time consuming. To deal with the problem, it is important to discover where the cows are picking up the mud.

- Muddy laneways cause muddy teats. Other major 'mud spots' are around water troughs, stock camping areas and shady spots.
- Muddy spots can soon form on areas where cows congregate – trees and shade in laneways can create wet spots too.
- Feed pads need regular cleaning – they can be a source of manure and dirt.
- Good teat skin condition helps keep the teats cleaner – dirt finds it harder to stick to healthy skin.
- Protecting the teat skin with an emollient in the teat disinfectant is an easy way to improve teat skin condition.
- Removing excess hair from around the udder reduces the need for washing teats. Clipping hair from tails and 'flaming' udders is also an effective measure.

A good laneway system keeps the udder and teats cleaner, and reduces the time needed for washing and drying teats.

Strategic washing versus washing every cows' teats

In an ideal world, the farmer would wash every teat of every cow, then dry the teats with paper towel before attaching the clusters. In countries where cows are bedded in stalls, it is an essential part of pre-milking hygiene. However, washing every cow's teat is not always practical on most commercial dairy farms in Australia, due to the larger herd sizes that are milked.

- Countdown Downunder recommends that clusters should be attached to clean, dry teats.

- It is generally more practical to wash and dry only those teats that are visibly dirty – strategic washing.
- Apart from concerns about milk quality, a dry teat reduces the chance of environmental mastitis infection.
- Dry teats interact better with the teat cup liner, resulting in better milking and less harm to the teat itself.

Trials done to compare strategic washing (washing only those teats that are visibly dirty) and washing and drying all cows' teats showed no difference in milk quality between the two systems.

Washing teats

Regardless of the overall policy relating to teat washing, if a teat is visibly dirty, then it will need to be washed. Some issues to consider include:

- Wash the teats only, not the whole udder.
- Washed teats should be dried – if the teat is not dried, dirty water moves down to the teat end and gets into the milk via the teat cup. Mastitis infection rates may increase as a result.
- Teats should be dried with individual pieces of paper towel. Udder cloths should not be used to wash teats – the cloth will transfer bacteria onto the next cow's teats.
- Hard-to-remove dirt should be rubbed by hand or a paper towel.
- It is important for the milker to wear gloves during milking, to reduce the chance of spreading bacteria.
- After cleaning the teats, gloved hands should be rinsed with clean water, then sprayed with teat dip.
- Milkers' gloves should be rinsed frequently in running water – at least after each row of cows.
- Using an emollient (teat skin conditioner) with the teat disinfectant makes it easier to remove dirt by improving the teat skin condition.
- A low-pressure clean water supply is the ideal choice for washing teats.

Remember: Clusters should only be attached to clean dry teats.

Problem cow identification

Identifying problem cows is a key part of the milking routine. Problem cows might include:

- cows treated with drugs;
- cows to be drafted for herd health procedures or AI; and
- cows that impact on the milking routine – three 'teaters', colostrum cows, kicking cows or slow milkers.

Quickly identifying problem cows saves time and enables milkers to take appropriate action sooner.

- Most critical to identify are cows whose milk should be withheld from the vat.
- Examples of identification systems include using stock paint on udders, coloured tape on back legs or the tail, electronic cow identification tags and written records.
- Keeping treated cows in a separate herd and milking them last is one option. Remember to clearly identify them as having being treated, in case they get back into the main herd by mistake.
- Electronic identification can be used to create a computer-generated warning at the cups-on position or even to lock the cluster to prevent milking. This is usually used in combination with another method.
- A leg band is a good semi-permanent ID for 3 teaters and slow milking cows.
- Whatever system is used, written records are needed and problem cows should be instantly recognisable to every milker – including relief milkers.
- Display the farm's problem cow identification system in the dairy – such a guide is invaluable for all milking staff.
- Involve staff in discussions about how the system is set up – they will be the ones using it.

The slow milking cow, p111.

Identifying problem cows needs to be done accurately and easily at every milking.

Keep spray paints away from children's reach.

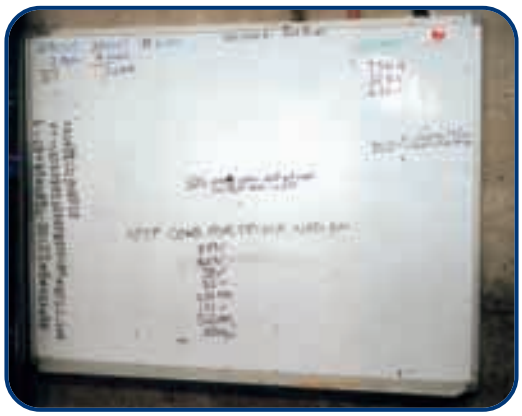

Figure 5.3: Using more than one method to identify treated cows ensures milkers withhold milk from the vat.
Source: National Milk Harvesting Centre.

Quick Note 5.7 – Automated drafting systems.

Cluster attachment

It is during this part of the milking work routine that the cow and milking machine make physical contact for the first time. The milker must recognise the best time to attach clusters and should use a gentle but efficient action.

A consistent routine (between different milkers too!) should make the cows more accepting of the procedure.

- Teat cups should be attached gently and in the same order, so that the cow is not disturbed or irritated.
- Clusters should be attached in a quick and efficient manner to minimise letting air into the system.

Attaching clusters before cows are let-down does not save time.

Kick rails at 'cups-on' will reduce injury.

Cluster removal

The aim at this stage of the milking work routine is to remove clusters at the correct time to prevent under or over-milking.

- Clusters should be removed when there is less than 100 mL of milk in any quarter – usually an end flow rate of between 200-300 mL per minute.
- Practically, this looks like a small, continuous dribble down the sight bowl.
- Incomplete milking is defined as having more than 20% of quarters with greater than 100 mL of milk that can be stripped out by hand after milking.
- Over-milking is a more common problem on Australian farms than incomplete milking.
- Fresh cows, young cows with small teats and cows on test buckets are especially susceptible to injury through over-milking.
- Do not use weights or machine strip cows – it encourages over-milking.

It is better to err on the side of caution by removing the cluster earlier – over-milking causes teat end damage.

Manual cluster removal

The correct way to remove clusters is outlined below.

- The first step is to break the vacuum. Kink the long milk tube or pull the vacuum cut-off valve and wait 1-2 seconds while the claw fills with air at atmospheric pressure.
- Clusters should take no longer than 2 seconds to start sliding off the teats. Clusters which do not slide off freely slow down this routine.

- For large volume clusters (400 ml plus) it is necessary to kink both the long milk tube and pull the vacuum cut-off valve to break vacuum in a timely manner. Even so, it can take the claw up to 4 seconds to reach atmospheric pressure.
- The milker then should be able to hang up the clusters on a convenient hook or swingover it over to another cow.
- Residual vacuum slows the milker down when taking the cluster off and may cause mastitis and affect cow comfort.
- Check air admission holes and repair faulty vacuum shut-off valves as soon as possible.
- Excessively swollen teats are the result of milking machine malfunction or excessively long milking times.

Clusters that are hard to remove or are not being released correctly are a sign that the equipment is not working properly. If the cows are protesting at cluster removal, check the technique and the machine function.

If clusters are removed manually, milkers need to have enough time to reach all cows before significant over-milking occurs. Some dairies require milkers to handle too many sets of clusters.

Dairy size, p179.

Removing clusters from agitated cows is dangerous.

Automatic cluster removal

Automatic cluster removers (ACRs) take the guess-work out of predicting the end point of milking and allow substantial increases in productivity per milker. Many milkers have commented on how this equipment de-stresses milking.

If this equipment is to be installed, it should:

- be applied to herds with good cow let-down/preparation for milking;
- do the job as well as a good milker;
- be mechanically reliable;
- reduce the stress of milkers;
- save labour or improve the productivity of existing labour; and
- maintain good udder health and milk quality.

Automatic cluster removers will only begin to pay for themselves if they allow extra milking units to be installed, reduce the number of milkers or reduce serious over-milking.

Table 5.3: Pros and cons of automatic cluster removers (ACRs).

On the upside ...	On the down side ...
◣ Clusters are always removed, regardless of the labour in the dairy	◣ The milking area may become cluttered, especially in swingover dairies
◣ Milking may be quicker (not always the case)	◣ The time required to attach clusters may be marginally longer as the cluster removers must be activated
◣ Clusters are removed promptly at the end of milk flow, which reduces over-milking	◣ Cluster removers may be an expensive luxury item if milking staff can keep up with the present number of milking units in the dairy
◣ More accurately and reliably detect the end of milking or low flow rate than people	
◣ If clusters are kicked or fall off after initial period, they are quickly hung up, reducing the risk of sediment problems in the milk	
◣ ACRs reduce milker stress	

Source: National Milk Harvesting Centre.

Some problems can be experienced in the initial period after installation until the routine is changed to suit the equipment.

- ACRs provide a consistent end to milking and are a tool to help minimise trauma to teat tissue and the teat canal.
- Correct installation is essential.
- In swingover dairies, a swing arm or sliding track is preferable, to position the cluster remover behind the cow, so that the cluster is lifted up on removal, rather than being pulled backwards.
- Using swing arms to position the cluster remover has the added advantage of improving cluster alignment.
- In dairies where the milker is operating close to the maximum number of units, ACRs remove a particular source of stress. It is often hard to put a dollar value on managing stress, but it should not be forgotten.

Many people are not aware of how much over-milking occurs in their dairy. There can be up to 8 minutes of over-milking for heifers. In some swingovers with ACRs, heifers have been seen to finish milking out well before the rest of the row has had the units attached. Two minutes or more of over-milking in swingover dairies is common in Australia.

Automatic cluster removal works best when cows are correctly prepared and let-down for milking. This may require changes to the milking routine to ensure that teats are plump with milk before clusters are attached.

Figure 5.4: Rotary platform with cluster removers attached.
Source: National Milk Harvesting Centre.

Ensure ACRs hang at an appropriate height to avoid repetitive strain injuries.

Idle cluster placement

Brackets are required where clusters are hung up for a short period of time before attachment to the next cow. Providing convenient brackets to hang idle clusters encourages milkers to remove clusters from cows and avoid over-milking.

- It is important to consider the OH&S implications of bracket placement. They need to be sited at a height that does not require the milker to bend.
- The bracket should be within arm's reach of where they are needed.
- The clusters should also be placed where they can hang correctly in a hygienic area.
- Brackets should not obstruct the milker while doing other tasks. Brackets should store clusters to minimise potential damage to clusters, either by the milker or cows.
- Repair or replace broken or missing brackets – shoddy brackets waste time.

Cluster brackets between hip and shoulder will reduce lifting injuries and operator fatigue.

Brackets should not be sharp or protrude into the work space.

Checking for teat end damage

Sub-standard milking machine performance can be painful to cows. Checking teat ends for damage can indicate if the milking machine needs to be adjusted.

Teat-end damage is one sign of a possible fault in the milking machine and that the milking process may be painful to the cow.

Teat disinfection

There are a number of ways to reduce the time and effort involved in teat disinfection, but care should be taken to ensure good coverage – otherwise protection will be incomplete.

- Disinfecting teats plays an important role in mastitis control, and teat and udder health.
- The addition of an emollient (teat skin conditioner) helps to keep the teat skin supple.
- Mud and excreta will not adhere as easily to the teat if the skin is in good condition and free from cracks.
- Countdown Downunder promotes the coverage of the entire teat barrel to lower bacterial numbers on the teat.

Various methods are used to disinfect teats. Evaluate each method in terms of the impact on the milking work routine and effectiveness of application.

Teat dipping

Teat dipping is very effective, as it gives good coverage of teats. The trade-off is that it is time consuming.

- Aim to use 10 mL per cow per milking.
- Squeeze-type cups or an anti-spill teat dip unit will reduce spillage (see Figure 5.5).
- Squeeze cup applicators also ensure that at least the lower portion of teats are completely covered every time.
- Replace the solution frequently throughout milking – avoid just topping it up.
- Replacing the solution reduces contamination by milk from cow to cow. Contamination reduces the efficacy of the mixture.
- Having several cups strategically positioned in the dairy means there will always be a teat dip handy.

There is a product available that is a compromise between a teat cup and a spray wand. 'Power dippers' consist of a dip cup on a wand connected to a reservoir carried by the milker. These systems provide a clean solution to each cow and reduce the amount of solution used. However, there is a concern that the units currently available are designed for teats smaller than that normally found in Australian herds. Therefore, they may give less than full coverage of the teat barrel. A bigger cup will soon be available for the Australian market.

Figure 5.5: Teat dipping cup.
Source: National Milk Harvesting Centre.

An important OH&S benefit of dipping methods is that milkers are not exposed to mists of the disinfectant.

Hand-held teat spraying

Teat spraying is more widely used than teat dipping as it can be speedily implemented. However, it still takes time to do it properly.

An effective spraying technique involves:

- Spraying continuously – avoid spraying jets intermittently, as coverage will not be complete.
- Spraying while moving wand in a circular pattern – adjust the angle of the spray gun to ensure good coverage.

Check the efficiency of techniques in the following way:

- Volume of spray used – aim for 20 mL per cow, per milking.
- Check spray technique – wrap paper towel around teats just sprayed to check if disinfectant covered all surfaces.
- Check the spray pattern by spraying upwards onto a sheet of paper and adjust or replace the nozzle if necessary. A solid cone of spray is preferred.

There are two general types of hand-held systems available.

- Manually operated pressurised unit with its own reservoir.
- Semi-automatic system – solution is delivered through a pressurised line from a central reservoir. There are normally a number of nozzles suspended in the milking area for the milkers to use.

Either system can give good coverage if used correctly and both can be very time efficient.

Spray guns & nozzles

Spray guns and nozzles should be of robust design.

- The nozzle should extend 300 mm to 400 mm from the handle.
- An upwards angle of 90° ensures good coverage of all teats is achieved.
- Long spray wands also reduce the risk of milkers inhaling the fine spray, being kicked and make it easier for the milker to cover all of the teats.

Having spray units at conveniently placed locations around the dairy means time is not wasted walking to pick up the spray unit.

Figure 5.6: Teat spray unit as a permanent fixture.
Source: National Milk Harvesting Centre.

Use a long wand to avoid putting hands between the cows' legs.

Avoid inhaling fine mists of chemical. Some people become sensitised to them.

Automatic teat spray units

Automatic teat spray units are most commonly installed in the exit race or just prior to exit on a rotary platform. Automatic teat spray units have the potential to save a great deal of time.

At this stage, these systems do not achieve 100% coverage of all teats, as udders vary in height and shape, and the movement of cows and positioning of legs make it difficult to get a direct hit. However, many operate more effectively than a poor manual operator.

- Jets are activated by photoelectric cells, ultrasonic beams or triggering flaps mounted on the side of the race (see Figure 5.7).
- Automated systems tend to use more disinfection solution per cow than a manual systems, but still meet the Countdown Guidelines of 20 mL/cow/milking.
- Several models for use on rotary platforms have now become available. The efficiency of these systems is also affected by udder shape and the position the cow is standing in. They are useful if the milker is stretched at 'cups off' or this position has been fully automated.

Until more accurate automatic systems become available, manual systems, used carefully, provide the best spray coverage of the teat and the most economical usage of disinfectant solution.

Figure 5.7: An automatic teat spray unit integrated into an automatic drafting system.

Source: National Milk Harvesting Centre.

Site automatic teat spray nozzle down wind of work areas.

Cow exit

The design of exit races and feeding in the bail can both have an impact on how quickly cows leave the milking platform. Key issues to consider include:

- The exit path should be as free from restrictions as possible.
- Ideally, in herringbones, the first few cows in the new batch should be able to follow the milked ones as they leave.
- These new cows can then be prepared for milking while the rest of the line is getting into position.
- Time may not be saved in the overall milking process if clusters are attached before teats are plump.

Exit design

All factors impacting on how quickly cows exit the milking platform should be considered.

- Exits that are short, wide and have minimal turning are the best – remove sharp corners if possible.
- Exit lanes should be about 2500 mm wide. If there must be a turn, there should be a clear 3000 mm passage for the cows.
- If cows exit from an elevated platform, a ramp is preferable to steps.
- Think about putting in skylights at the exit point to ensure light intensities are similar inside and out.

Feeding — effect on exit

Feeding in the dairy can reduce the speed at which the cows leave the dairy. If milking time is less than cow eating time, the cows will stay to eat the remainder of their feed.

- Some cows 'eat' their way out of the dairy, snatching every crumb they can on their way out.
- Consider exit systems that block off the feed trough – rapid exit systems and some stall gate designs.
- Systems that require all cows to file out through a single exit gate past an open trough are likely to cause problems with cow-flow on exiting.

Drafting

Drafting should be able to be done without the milker leaving the pit. Many farmers rig up their own sets of gates and pulleys to ensure drafting can be done from the pit.

- The drafting system should be set up so that cows walk through it every day.
- It is important to locate the drafting gate far enough from the milking platform so that an entire batch has room to move off the milking platform as they prepare to go through the drafting system.
- Drafting is made easier if cows pass the drafting gate in single file.
- Positioning the drafting gate a short distance down a race will assist in this.

- Ensure cows can see an exit. If they can't, they are likely to bunch up looking for a place to go. This will also delay refilling the milking platform.
- A blocking gate on a manually operated drafting system can be used to prevent unwanted cows from entering the catching yard before the gate can be closed.
- Properly functioning drafting systems remove a lot of stress from milkers.

Automatic drafting is becoming increasing common.

- For best results, automatic drafting should be planned into the dairy exit during the design phase.

Quick Note 5.7 – Automated drafting systems.

Automatic drafting systems are potential crush hazards.

Exit gates

Another factor controlling cow-flow through a herringbone dairy is the exit gate. A good exit gate should have the following features:

- opens and closes quickly and is easy to operate;
- is controlled from any position in the pit;
- operates vertically or, when closing, does so from the breast rail towards the pit; and
- is wide enough to allow for good cow-flow.

When using gates, the milker must have good control over cow movement and be able to intercept any cow in a single file line. Cows entering in the dairy are able to follow in directly behind those leaving, reducing dead time in the milking routine.

Be aware that almost all exit gates have pinch and crush points.

Figure 5.8: A powered gate is easy to operate.
Source: National Milk Harvesting Centre.

Batch exits / rapid exits

There are a number of different systems on the market that allow for the batch exit of cows.

These types of systems are some of the quickest in terms of cow exit times. Side exit times have been observed to vary from 8 to 25 seconds. This generally means that cows exit in less than 2 seconds per cow. This system is definitely worth thinking about when upgrading or building a new dairy, especially when looking at cluster numbers of more than 15 clusters per side.

Figure 5.9: Batch or rapid exit gate system.
Source: National Milk Harvesting Centre.

Many rapid exit systems have potentially lethal crush and pinch points. Ensure safety switching and guards are in place.

Rapid exit drafting

Rapid exit systems do create a challenge when it comes to drafting.

- Most rapid exit systems have two exits. That means that the drafting setup must be duplicated on each side of the dairy.
- Some rapid exit dairies are designed so that the cows walk around the milking area to exit through a single exit race, removing the need to duplicate drafting infrastructure.

Cow exit — rotary dairies

Exit areas on rotary dairies are generally 2.5 to 3 stalls wide. Cows also need enough room to be able to turn around comfortably.

- To ensure that cows exit the platform, some milkers hang something soft at the cow's head height just past the first point of exit.
- A jet of water directed at the cows' shoulders can encourage them to leave the platform. These can be activated by a solenoid to give a burst of water – this reduces the water usage compared to a continuous flow.
- Passive stimuli can include a flashing light mounted at the exit position to provide a visual cue to leave the platform. This has no physical ramifications for the cow if she has to go around a second time.

Discouraging re-entry

It is important to train cows not to re-enter. It may be necessary to stop the platform and chase cows out during the training period.

- Hanging a heavy sheet of plastic or rubber matting over the last exit stall space provides a visual barrier to animals that have already backed off. If a cow backs off a bit late, the curtain is flexible so that she can back out under the barrier.
- Make sure that the feed system does not reward cows that re-enter!

Miscellaneous

The milking work routine also includes other tasks, such as fixing cluster slips, drifting, rinsing equipment, attacking test buckets and the like.

These tasks are minimised in efficient routines, but some time allowance for miscellaneous tasks is still required.

Cluster slip

Constantly re-adjusting clusters or attending to cluster slips breaks up the milking work routine and increases the risk of mastitis infection.

Cluster slips can be caused by:

- low vacuum reserve;
- poor cluster alignment in relation to the udder;
- heavy clusters;
- uneven weight distribution within the cluster;
- worn cup liners, liner type; and
- blocked air admission holes.

Less than 5 cluster slips per 100 cows is the target that Countdown Downunder recommends – this target excludes cows with very poor udder conformation who always have cluster slip.

Quick Note 4.2 – Choosing clusters.

Milking the cow

After the clusters have been attached, the milking machine takes over! The time the cluster is attached to the cow is not considered as a task in the milking work routine, as the milker can do other tasks while the machine milks the cow.

The time that the cluster is attached to the cow is important to know. It includes:

- The time required to extract the milk from the cow, including a delay time before the cow starts to let-down the milk – the 'milk out time'.
- Any 'dribble time' near the end of milking.
- Any over-milking time – where the cluster is left on the udder after milk flow ends.

With good milking management procedures, the length of time that the cluster is attached to the cow can be significantly shortened. This minimises the delay for let-down, 'dribble time' and over-milking.

Milking management will largely determine the length of time that clusters are attached to the cows. Good milking management limits this time to the milk out time only.

Cluster throughput, p179.

Let-down hormone

Consistent and calm routines provide enough time for the oxytocin let-down hormone to have its effect on the udder.

- It takes between 60 and 90 seconds for the oxytocin hormone to have its effect on the udder after being released from the brain.
- Oxytocin acts to 'squeeze' out the milk from the milk-producing tissue at the top of the udder. This forces the milk down into the teat, where it can be drained away under vacuum by the milking machine.
- The action of let-down causes the teats to feel 'plump'.
- The action of oxytocin is blocked when the animal becomes fearful or agitated.

Milk out time

Assuming that the cows are let-down at cluster attachment, the clusters are properly aligned on the udder and the milking machine is functioning optimally, the following milk out times can be expected.

Table 5.4: Milk out times.

Most cows producing ...	Should be milked out in about ...
10 litres milk per milking	5 minutes (± 1 minute)
15 litres milk per milking	6 minutes (± 1 minute)
20 litres milk per milking	7 minutes (± 1 minute)

Source: Countdown Downunder.

The speed of rotation of a rotary platform is closely related to the milk out time of the cows. It has been suggested that on a rotary the optimum rate of allowing cows to go around for a second time is between 12% and 16%. More recent survey work suggests a rate closer to 5% is more acceptable.

If a cluster is attached to teats after let-down the flow of milk reaches its maximum flow rate more quickly. Individual cow milk out times are minimised when:

- The cows reach their maximum milk flow rate quickly.
- The maximum milk flow rate is maintained through the milking.

The maximum rate at which milk is able to leave the udder is largely determined by the width of the holes (streak canals) at the end of each teat. The maximum milk flow rate of an individual cow can not be exceeded and commonly would be 3-5 litres per minute.

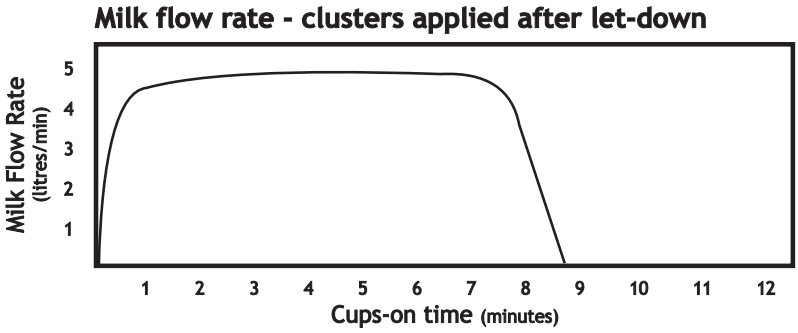

Figure 5.10: Milk flow rate – clusters applied to 'plump' teats after let-down.

Source: National Milk Harvesting Centre.

Many cows in Australian dairies are not let-down or ready to milk when the clusters are attached. This can have a major impact on milk out times and udder health.

Prolonged milk out times

If let-down has not occurred and the teats are not plump at cluster attachment, a number of things happen:

- If let-down has not occurred, there will be a period of no milk flow after the initial milk at the base of the udder has been removed – about 30-60 seconds after cluster attachment.
- During this time, the teat is subjected to full system vacuum – potential for teat damage.
- Also during this time of low milk flow, the teat cups tend to ride higher up the teats.
- This early teat cup crawling causes a partial blockage for milk leaving the udder.
- Towards the end of milking, the milk flow can slow to a dribble due to this partial blockage.
- The overall effect is to significantly slow the milk out times of cows by having a period of low milk flow at the start and/or end of milking (see Figure 5.11).

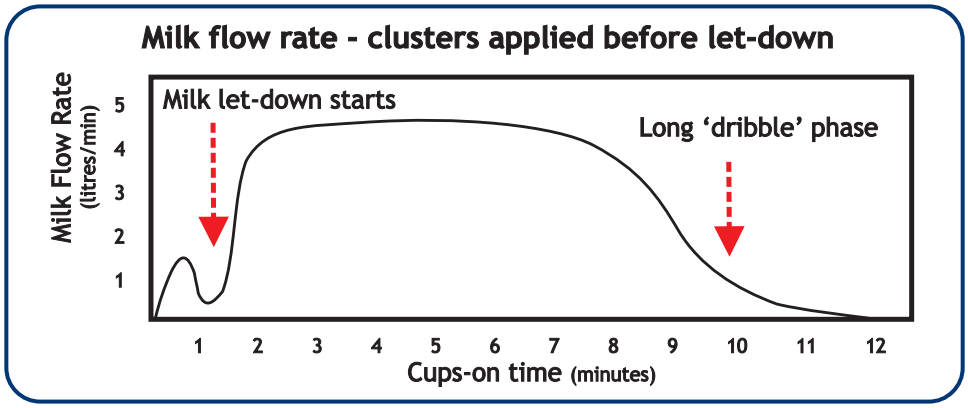

Figure 5.11: Milk flow rate – clusters applied prior to milk let-down.

Source: National Milk Harvesting Centre.

Longer milk out times, especially at low milk flow, risk damaging teat tissue and reduce milking labour productivity.

Keep in mind — cow comfort

Prolonging the time that the cluster is attached to the udder increases the risk of injury to the teats – making the milking a painful experience for the cows. Cows experiencing pain or discomfort during milking will regularly step from foot to foot and sometimes kick.

- Counting kicks and steps is a quantitative measure of cow comfort and is advocated by Countdown Downunder.
- Frequent urination or dunging in the dairy is another sign of cow discomfort at milking and also adds to the clean-up time.

Reduce kicking by improving teat condition through shorter milking times.

Attaching clusters — the right time

If a period of no flow a minute after cluster attachment has been identified, it may be beneficial to delay attaching clusters until after let-down has occurred. Strategies include:

- Evaluate the dairy entry routine to ensure calm cows enter the platform.
- Allow cows time to settle before attaching clusters to the first cow in the batch.
- In rotaries – move the cluster attachment position further away from the entry point so that the cows have been on the platform for a minute before cluster attachment.
- Build an entry race in the lead up to the platform – especially useful for rotary dairies.

To shorten milking times, improve yield and maintain teat health, clusters must be attached to plump teats. Plump teats are evidence that let-down has occurred.

The slow milking cow

A single, slow milking cow in a batch can hold up a whole side of cows in a herringbone. In rotary dairies, slow milkers go round twice and take up a milking position which could be used to milk another cow.

In many cases, the number of these cows can be reduced by careful handling to ensure good let-down prior to attachment. However, some cows are naturally slow milkers and management can minimise their impact on the milking routine.

- It is a good idea to have slow milking cows clearly marked. Milkers can then take appropriate steps to minimise the impact they have on the rest of the batch.
- A common strategy is to attach the clusters to slow milking cows first.
- Rubbing the teats before the cluster is attached helps stimulate better milk out. More than 15 seconds of teat stimulation (per udder) is required to shorten milking time.
- An extra set of clusters in a swingover herringbone (a 'lazy cluster') is sometimes used for slow milking cows. However, the extra cluster may cause spacing problems and upset cluster alignment.
- In larger herds, it may be possible to split the herd into two groups – faster milking cows in one group and the slower cows in another.
- If no other treatment modifies their milk out time, consider culling excessively slow milking cows. Even if the cow gives the most milk of the herd, how much is the milking out time costing?
- Check the cluster removal routine to ensure that milkers are correctly identifying the end point of milking.

The National Milk Harvesting Centre is exploring ways to improve the milking speeds of slow milking cows. Early results suggest that there is no negative impact on the yield of cows by terminating milking early. If this experiment is verified by further work, it will mean that slow cows will cause less of a problem in the future.

Having a herd made up of cows with similar milk out times greatly improves labour productivity and simplifies the routine.

Rounding up ...

Make sure the milking work environment is safe, comfortable and easy to work in for the milkers and provides good levels of cow comfort.

Look at all the tasks in the milking work routine to ensure the milker's time is spent improving productivity and maintaining herd health.

CowTime Cost Cutters

Many of the suggestions covered in this chapter can be easily implemented and for little cost. The following list contains quick and cheap changes to improve key aspects of this stage of the milk harvesting process:

- Repairing boggy areas will save time in cleaning teats.
- Use a fail-safe system to identify treated cows.
- Encourage milkers to have positive interactions with the cows and minimise negative interactions in the dairy.
- Maintain equipment to reduce frustrating breakdowns.
- Remove pipework features that discourage cows from moving into the first bail position in herringbone dairies.
- Take steps to reduce noise in the dairy. Train staff to be calm and quiet. Insulate or remove high-intensity mechanical noises where possible.
- Rubber mats on the pit floor can improve milking comfort.
- Install cluster storage brackets so they are easy to reach.
- Get another person to examine your work routine time to check for efficiencies.
- Pour waste milk into a vessel in the pit and pump it out once at the end of milking.
- Reduce the number of 'pulls' required to dispense feed in manual feeding systems.
- Attaching clusters to 'plump' teats reduces cow milking times.
- Pay attention to cluster alignment to improve milking out.
- Work out a strategy for slow milking cows.
- Check teat disinfection equipment – is the time spent used effectively?
- Rig up a blocking gate for manual drafting systems.
- Installing ropes and pulleys to control drafting from the pit reduces stress.
- Run a lever along the pit that allows the control of exit gates from anywhere in the pit.
- Widening the exit can reduce cow exit times.
- A chain, flashing light, jet of water, hanging drum or other suspended object can assist getting the cows off rotary platforms.
- A material curtain can prevent cows getting back on the rotary platform after exiting.

Further information ...

Countdown Downunder Technote 5.3 – teat cleaning.

Countdown Downunder Technote 6.1 – milking speed.

Countdown Downunder Technote 5.5 – machine stripping.

Countdown Downunder Technote 5.7 – cluster removal technique.

Countdown Downunder Technote 7.6 – spray or dip whole teat.

Countdown Downunder Technote 7.7 – teat disinfection.