Technote 6

Monitoring and maintaining milking machine function

In this technote:

1. Milking machine function and its effect on udder health
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It is important to remain vigilant throughout lactation to ensure milking machines operate correctly and are used properly. Poorly functioning machines can contribute to new intramammary infections, either directly or indirectly (O'Shea 1987; Mein *et al* 2004; Upton *et al* 2025), through:

- spreading bacteria between teats and cows;
- damaging teat health and natural defence mechanisms; or
- reducing efficiency of milking and udder evacuation.

Milking machines are designed to harvest milk efficiently while maintaining healthy teats. Teats spend 50-100 hours attached to the machine per lactation, so understanding how the machine affects teat tissues highlights the importance of regular maintenance.

Components of a milking machine are described in the Figure on page 3.

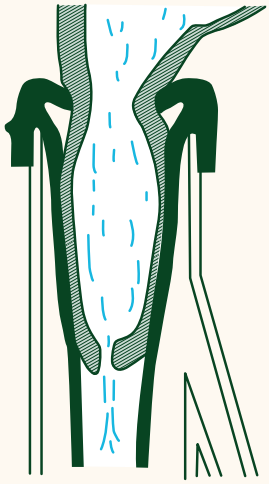
① Milking machine function and its effect on udder health

Milk flow phase of each pulsation cycle

During the milk-flow phase, the teat is drawn into the liner and stretches to conform to the internal dimensions of the liner. The vacuum in the mouthpiece cavity of the liner keeps the liner in position.

Stretching of the teat walls, and movement of milk due to the pressure difference between the teat sinus and open liner of the teat cup, causes the teat canal to open and milk to flow (Figure 1). The teat end is constantly exposed to vacuum, and fluid accumulates in the blood vessels and tissues around the teat end.

Figure 1. When the liner is open

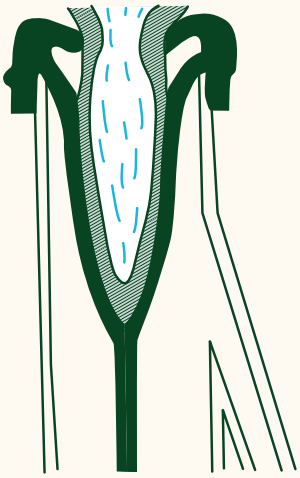


Machine milking creates a pressure difference that causes milk to flow, and the teat canal to open.

Closed phase of each pulsation cycle

Closure of the liner compresses the teat. As the 'compression' phase commences, the collapsing liner places most of its compressive force on the teat end and very little on the teat barrel (Figure 2). This massage phase helps redistribute fluid drawn into the teat end under vacuum, back up through the teat tissues, thereby reducing teat end congestion.

Figure 2. When the liner is closed



Pulsation provides a massaging action to keep the teat healthy

End of milking

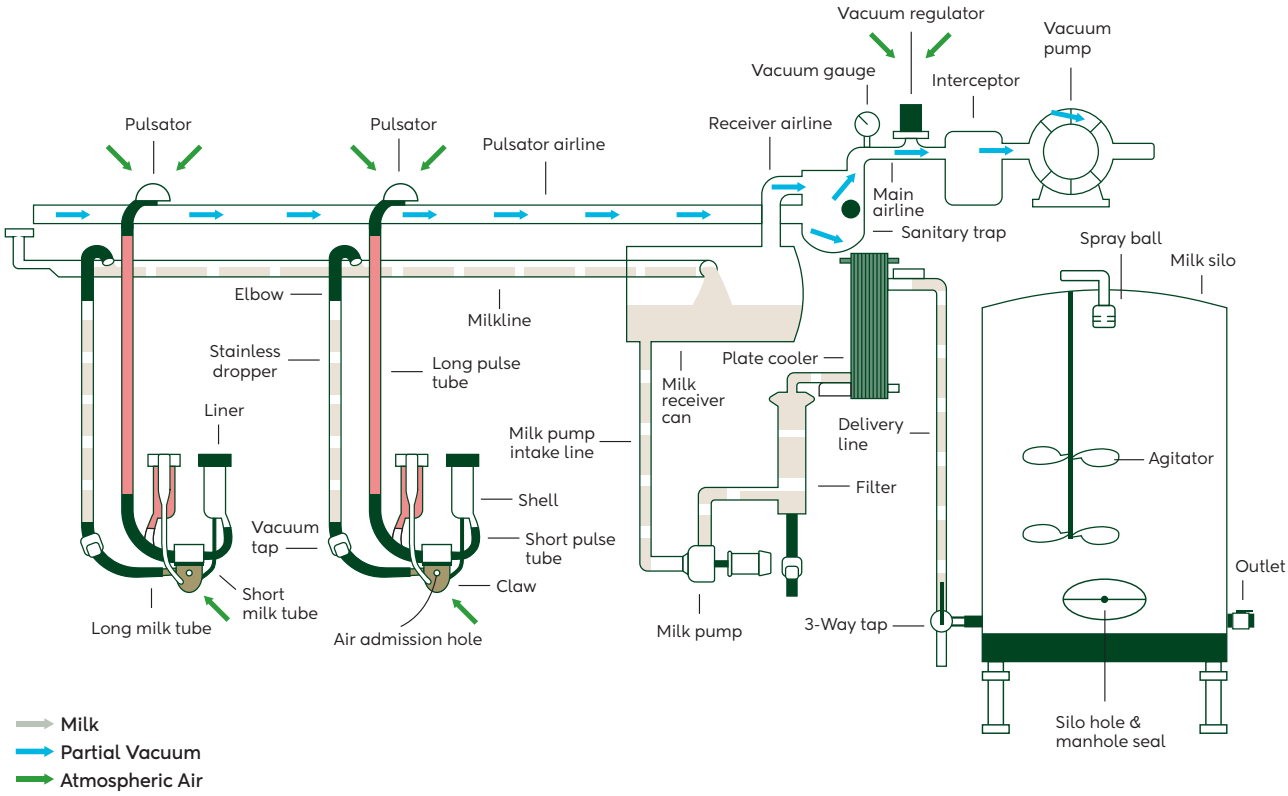
Each cluster has a small vent that admits air into the claw bowl during milking. This air admission hole is especially important at the end of milking, to allow the vacuum to equalise with atmospheric pressure, when the milkline is pinched shut or closed during cup removal. Blocked holes prevent the vacuum from equalising and can increase the risk of teat impacts, or rapid movement of milk droplets towards teat ends during cup removal.

Optimal milking machine operation must *"balance speed, chosen completeness of milking, and gentleness on teat tissue to support efficient milk removal and optimal udder health"* Upton *et al* (2025).

Field experience shows that mastitis problems are often resolved by fixing simple problems such as unsuspected high vacuum, pulsator or liner problems, or by clearing blocked air vents. Furthermore, teat condition is usually improved by greater attention to minimizing overmilking.

A regular, detailed and comprehensive analysis of milking machine function is necessary to define and correct problems.

Figure 3. Components of a milking system



Definitions of the components of milking machines are given in ISO 3918: 2007 Milking machine installations – Vocabulary. (ISO 2007a)

② Use the daily, weekly and monthly guides to check machine function

Inadequate routine maintenance of mechanical components and rubberware will, in time, cause the milking machine to function poorly, leading to a greater risk of mastitis. Regular, systematic checks (see Table below) aids early detection of problems, encourages preventive maintenance and enables basic trouble-shooting (Mein 1997).

Recommended daily, weekly and monthly checks of milking machine function

Daily checks[1]	Weekly checks[1]	Monthly checks[2]
Check air admission holes (vents).	Check for twisted liners.	Check regulator function.
Check the vacuum gauge.	Check rubberware for damage.	Check for perished and damaged rubberware.
Listen to the pulsators.	Check filters on pulsators or on filtered air supply lines.	Assess completeness of milking and milking times.
Watch milk entering the receiver can to ensure minimal slugging.	Count cup squawks and slips requiring correction by milker.	Check for damaged teats. Assess teat skin condition and teat end scores.
Check teats as cups come off.		
Note cow behaviour.		

[1] These tasks should be assigned to members of the regular milking team.

[2] These tasks should be the responsibility of the herd manager, with a trusted adviser.

Milking-time tests

These daily, weekly and monthly checks of milking machine function align with five milking-time tests that monitor teat condition, cow behaviour, average milking time, completeness of milking, and frequency of slipping or falling teat cups. A detailed description of each milking time test is given below.

1. Machine function and teat condition

Teats should be as soft and supple after milking as before milking. Teat tissue undergoes both short-term and long-term changes in response to the forces experienced during milking. Generally, changes in the teats due to machine milking are most obvious at the teat end:

- Teats that are slightly swollen or hard (due to congestion or oedema) or slightly blue or purple in colour (cyanotic) after milking result from machine-induced circulatory impairment.
- Teats that are thicker (with fluid) after milking may be due to use of wide-bore liners, or milking at high vacuum level (Hamann *et al* 1994).
- Cyanosis or oedema around the teat end or lower barrel indicates a pulsation failure such as insufficient collapse phase of pulsation, short teatcup liners or liners with insufficient tension.
- Cyanosis or oedema around the upper barrel of the teat may be due to liners with hard mouthpiece lips or high mouthpiece vacuum (Hillerton *et al* 1998, Ramussen 1997) or to overmilking or prolonged milking.

Machine milking can aggravate all types of teat lesions. It is the main cause of hyperkeratosis (teat canal or orifice), radial cracking, petechial haemorrhages (tiny blood-blisters) near the teat end, and may exacerbate teat chapping. Secondary infections that establish within teat lesions may present as 'black spot'.

➜ **Technote 9.2** describes how to assess teat skin and teat ends.

Early signs, like oedema and small haemorrhages heal quickly but may be early warning signs of a machine problem and increasing mastitis risk. Even 5 minutes of overmilking for 4 milkings can cause tissue damage (Hamann *et al* 1994), and significant changes in hyperkeratosis were detected when 5 minutes of overmilking was applied over a 6 week

period, compared to 2 minutes (Edwards *et al* 2013c). Regular checks of vacuum level, pulsators and liner suitability will help avoid teat damage.

2. Machine function and cow behaviour

Signs of cow discomfort or nervousness during cup attachment or removal can signal issues with milking machine function (Hillerton *et al* 1998). Shorter milking times, achieved through lifting the threshold for automatic cup removal, can also lead to reduced kicks and steps (Upton *et al* 2023). The frequency of stepping or kicking (the Kick Step or KiSt response) indicates levels of comfort/discomfort with the machine, and can be monitored objectively:

Guidelines for observing cow behaviour:

- **Step:** Hoof lifted clear of the floor. This involves a significant and deliberate shift in weight for the cow, making it easy to observe and record.
- **Kick:** A hoof aimed at cluster or operator or deliberate attempts to remove the cluster.
- One observer can monitor the rear legs of up to four cows at any one time, provided they stand out of the way.
- Kicks/steps with time stamps are recorded as the 'KiSt response' during specified events such as:
  - Waiting in the stall or bail to be milked - indicates issues with the environment such as flies or poor stall design.
  - Udder preparation, cup attachment, reattachment and cup removal or at post-milking disinfection – indicates issues with interactions between operator/cow, or machine/cow.
  - First and last 2 minutes of milking – indicates issues with milking machine function.
- Analyse the data as proportion of cows exhibiting 0 or 1, 2-4, 5-10, or >10 'KiSt' responses at different periods of milking.

A video camera, set up to record 1-2 hours of milking, can be used *in lieu* of direct observations. This can provide an effective means of demonstrating and analysing behavioural responses with minimal interruption to the normal milking routine. The sensitivity of teats to being touched can also be assessed by manual palpation just after milking (Hillerton *et al* 1998). But results in commercial herds will depend on how much cows are accustomed to being touched after milking.

➜ **Technote 13** provides more information on how the **Mastitis Investigation Kit** enables objective assessment of cow behaviour at different stages during milking.

3. Milking time guide

Field studies in France (Billon 1993) and the United States (Stewart *et al* 1993; Thomas *et al* 1993) show significant, consistent regressions between average milking time and average milk yield per cow per milking.

A way to assess machine function is to measure the average time taken to milk a sample of cows, where average cow milk yields are estimated from vat yield divided by the number of cow-milkings in the vat.

For herds operating without automatic cup removers (ACR) or operating with ACR at 200 mL/min, 80% of cows in a typical Australian or New Zealand herd should milk out within a particular time, related to the average yield. These yields and milking times are summarised in the Table below.

Guidelines for milking times for cows of different production levels

Average milk yield at a single milking	Time in which 80% of cows should have completed milking (min:sec)
10 L/milking	6.3 minutes (06:15)
12 L/milking	7.2 minutes (07:10)
14 L/milking	8.0 minutes (08:00)
16 L/milking	8.7 minutes (08:45)
18 L/milking	9.5 minutes (09:30)
20 L/milking	10.2 minutes (10:10)

Under these circumstances the expected strip yields, after cluster removal, should be 100 mL or less per gland. For herds with higher ACR settings, e.g. 400 mL/min, larger strip yields and/or shorter milking times will be observed.

➜ **Technote 5.8** describes the effects of under and overmilking and how to achieve shorter milking times in herds.

MaxT and shorter milking times

Research has shown that taking the cups off at a pre-determined Maximum Milk-Out Time (MaxT) saves time without affecting milk production, quality, mastitis or SCC (Clarke *et al* 2008; Jago *et al* 2010 a, b; Edwards *et al* 2013a, b; Upton *et al*, 2023).

A herd's MaxT depends on the average milk production per cow per milking. So if MaxT is applied at 80%, then the slowest 20% of cows would have their milkings truncated by removing clusters after 6.3 min.

4. Completeness of milking

Assessing completeness of milk-out of individual quarters helps identify machine or technique issues. With shorter milking times and MaxT showing benefits for mastitis risk and SCC, reducing overmilking is now more important than concerns about minor undermilking. The focus should therefore be on detecting poor milk let-down or gross undermilking of specific quarters, rather than residual milk volume.

The standard approach involves hand-stripping each quarter of an udder into a measuring container after cup removal and recording the volume of milk. Practical alternatives are described in the Table below.

- The qualitative assessment provides a practical alternative for herds where hand-stripping would be impractical or too risky, due to cows being unaccustomed to having their teats handled after milking.
- The semi-quantitative approach, involving partial hand-stripping helps improve diagnosis when used in combination with the qualitative assessment.
- Machine stripping, by reattaching the cups and holding down on the claw until milk flow stops may be possible where milk meters are permanently installed. This can provide a more reliable and repeatable measurement method compared to the more qualitative methods.

➜ **Technote 5.8** discusses the effect of incomplete milking (poor milkout) on mastitis and yields.

Guidelines for assessing completeness of milk-out as an alternative to full hand stripping

Record milk-out as:	Qualitative assessment	Semi-quantitative (hand-stripping of individual quarter)	Machine-stripping (based on whole udder)
G (Good)	Quarter is visibly wrinkled	5 or fewer easy strips (equating to <50 mL per quarter)	Less than 500 mL per udder
P (Poor)	Quarter appears slightly plump, possibly indicating unharvested milk	10 or more easy strips (equating to more than about 100 mL per quarter)	More than 500 mL per udder
U (Uneven)	One particular quarter appears plumper and less wrinkled, relative to the other quarters		One particular quarter appears plumper and less wrinkled, relative to other the quarters

Inconsistent strip yields in rear versus front quarters, or between quarters on the right side versus left side, usually indicates a problem of poor cluster positioning and/or cluster weight balance.

The most common causes of incomplete milking are:

- poor type or condition of the liner,
- clusters that do not hang evenly on the udder because the connecting hoses are too long, too short, twisted, or poorly aligned in relation to the cow,
- cup crawl caused by e.g. clusters that are too light when a wide bore liner is used or the vacuum is set too high,
- high or low milking vacuum levels; and
- a mismatch between the claw inlet and the short milk tube causing partial closure of the short milk tube where this tube joins the claw.

5. Frequency of slipping or falling teat cups

A slipping teat cup, or liner slips or squawks, disturbs the milking routine and may lead to problems with vacuum stability. Early research suggested slips could lead to 'impacts', the propelling of bacteria-laden milk droplets back towards the teat end of adjacent teats, due to vacuum fluctuations.

Early experimental studies by O'Shea (1987) demonstrated a link with new infection rates but larger scale trials could not support this. Cluster designs that specifically prevented impacts, such as fitting of deflector shields or one-way valves between the short milk tube and claw led to a reduction in new infection rates (Griffin *et al* 1980; Binde *et al* 1989) but the benefits were not sufficient for commercial adoption.

Improvements in cluster design and weight, and larger bore, long milk tubes have all improved vacuum stability (Upton *et al* 2025) and likely reduced the consequences of liner slip. Nevertheless, the need for a person to manually adjust a slipping teat cup disturbs the milking routine, adding to milker dissatisfaction with milking (Wieland &f Sipka 2023), and potentially affecting cow flow and risk of overmilking. It may also lead to adjustments in the milking vacuum to compensate, which may create another risk factor for mastitis.

The incidence of slipping or falling teat cups can be assessed by careful observation. Mein & Reid (1996) suggested that slips or falls requiring correction by the milker(s) should be fewer than 10, and preferably fewer than 5, per 100 cow-milkings. Liner slips or falls early in milking often result from:

- poor cluster alignment (including uneven weight distribution in the cluster),
- low vacuum,
- poor liner condition,
- mismatch between liner type or shape and cluster weight, bowl volume, or teat shape,
- blocked cluster air admission holes.

Liner slips late in milking are more associated with rough cup removal and not allowing the vacuum to equilibrate.

Documentation of monthly checks of machine function

Regular documentation ensures early detection of issues before they impact teat health or mastitis risk.

Results of the monthly checks should be recorded so trends can be assessed regularly. A standard place, such as an exercise book, wall calendar, pocket book, electronic file or dairy company record-keeping system may be used.

Monthly checks will help detect subtle changes due to wear and age in rubberware and equipment. For example, checking the effective reserve of the vacuum pump and regulator function can be achieved by keeping a monthly record of the vacuum with one or two milking units open. This is a simple method to test for possible deterioration in the reserve vacuum pump capacity (due to pump wear, air leaks, or regulator performance). More complex, automated milking systems may require checks that sensors are still working as expected.

③ When to call a milking machine technician

Refer to a milking machine technician, registered and certified by the NZ Milking and Pumping Trade Association (NZ MPTA), if concerned about the functioning of the milking machine.

They can test the following:

- Ensure the vacuum levels and airflows are appropriate for the machine
- Check pulsators are working properly and service faulty ones
- Check sensors and help correct faults promptly.

④ Change liners as per recommendations

Teat cup liners are manufactured from natural or synthetic rubber (commonly nitrile) or silicone, and are designed to:

- form an airtight seal at both ends of the shell,
- fit a range of teat sizes and shapes through different mouthpiece and barrel dimensions,
- minimize liner slips and cluster fall-off,
- allow rapid, complete milk-out, while minimising teat congestion, discomfort and injury, and
- be easy to clean.

During milking, liners flex and collapse with each pulsation, massaging the teat. When correctly matched to the teat cup, liners should be stretched 5-16% beyond their original length. Some liners include two or more 'tension notches' to accomodate shells of slightly different lengths. Over-stretched liners may provide good milking characteristics but are more likely to cause teat damage (Hillerton *et al* 2003).

Once in use, liners progressively lose tension, absorb milk fat, and harbour bacteria. Deterioration is accelerated by mechanical tension, exposure to sunlight, heat, cleaning chemicals and ozone (e.g. near motors). Material type, storage, cleaning, and usage patterns all influence liner lifespan.

Poor storage can result in liners being effectively expired before first use, e.g., when new liners are fitted before dry off and left under tension for the entire dry period. Perished liners reduce milking speed and completeness, increase teat-end damage, and increase the risk of mastitis spread.

Recommended liner replacement intervals are:

- **Rubber liners : ~2,500 cow milkings**, or 5 months, whichever comes first.
- **Silicone liners: ~5,000 cow milkings**

Despite their longer life, silicone liners are more prone to tearing and puncture, particularly if stepped on by the cow.

Because liner deterioration is often underestimated, regular monitoring is essential. Daily, weekly and monthly checks of milking times, milking completeness, teat-end condition, and cup squawks or slippage help identify liner-related problems early.

➜ Information is available on the DairyNZ website to help farmers calculate the life of rubber liners in their herd. An example is available at **Teat cup liners - DairyNZ**

"If you notice a difference when you renew liners, then the old ones were on too long."
- Graeme Mein

Choose liners that are compatible with shells, claw inlets, jetters and teats

When selecting liners, **choose liners that are part of a manufacturer's chart of recommended matching combinations**. This strategy minimizes potential compatibility problems and warranty issues.

Key aspects to consider (Fox *et al* 2009) include:

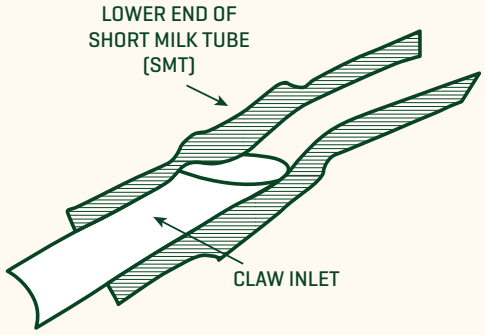
1. **Ensure that liners fit the shell**

- Liners should seal airtight in the shell, resist twisting and the barrel can be stretched between 5-16% of its original length when mounted in the shell. The liner mouthpiece should not distort. Check that the size and shape of the mouthpiece lip does not change substantially when mounted in the shell.
- Check the liner is held firmly at the bottom of the shell, without air leaks or easy twisting of the liner in the shell. Make sure the internal diameter of the short milk tube (SMT) is not pinched where it connects with the shell - hold the liner up to the light and look through it to ensure that the shell does not noticeably constrict the SMT.

2. **Ensure that liners fit the claw nipples**

- Check manufacturer's tables for the SMT recommended for the teat cup.
- The internal diameter or bore of the SMT should be 2-3 mm narrower than the external diameter of the claw inlet or nipple.
- Excessive stretching of the SMT will make it more prone to 'stress cracking' and splits if a cow kicks or steps on the cluster.
- An overstretched SMT may also restrict milk flow from the SMT into the claw as illustrated in the Figure.
- Check that the vacuum cut-off region in the SMT is compatible with the shape of the claw inlet. Some combinations prevent the milking vacuum from being shut off when the teat cups hang down, during cup attachment.

Restriction to milk flow that can occur at the claw inlet



Note the milk flow path from the teat cup into the claw is partially restricted at the point where the flexible SMT is connected to the rigid claw inlet.

3. **Ensure that liners are compatible with the jetters**

- Try before you buy. The liner needs to stay in or on the jetter during the wash cycle without substantial leaking of air so the CIP (cleaning in place) system can operate effectively.
- Watch out for mouthpiece distortion if the liner mouthpiece does not match the jetter correctly.

4. **Ensure that liners match the average teat size for a given herd**

- As a general rule, select liners that favour younger cows rather than older ones. Using for example, large bore liners to get faster milking of old cows, will be self-defeating, causing teat stress or discomfort for younger cows.
- Liner bore. As a general guide, medium bore liners, with a mid-barrel bore of 21.5-24.5 mm measured 75mm below the mouthpiece lip, are suitable for average teat diameters of about 23.5 mm, which is typical for most NZ herds.
- **Effective length of a liner when mounted in its shell**. Early research identified that pulsation often failed on cows with long teats, causing them to be pulled too deeply into the teat cup, leading to insufficient squeeze of the teat end, and more mastitis. Liners with longer effective length were developed to avoid this problem of pulsation failure. Nowadays dairy breeding

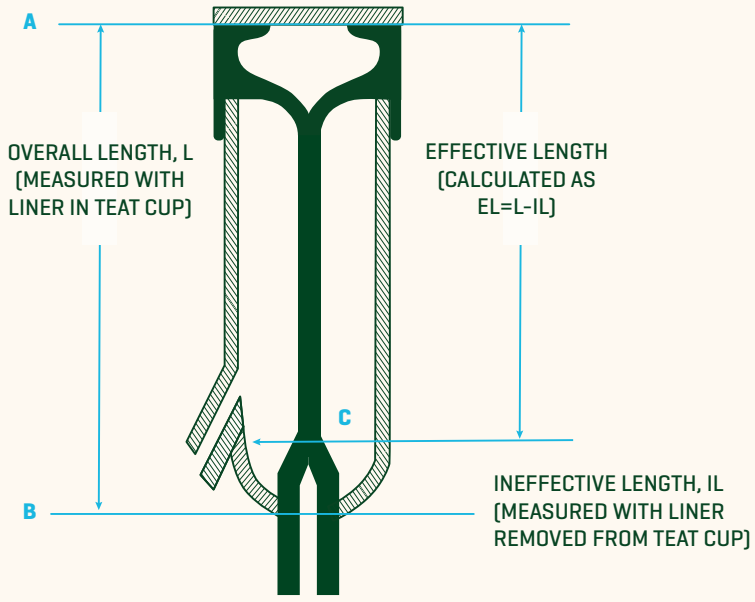
and selection programs have resulted in shorter teats for NZ cows and it is rare to see teats that are more than 75 mm long now, however, it is still useful to know how to calculate the effective length of a given liner (see Figure below). Assuming that 95% of teats are not more than 75mm in length, then a minimum effective length of about 135mm would be adequate for most liners and herds.

- **Mouthpiece ineffective length.** If the mouthpiece or lip cavity is too deep (>25 mm), very short teats do not get adequate support from the liner barrel when it is open, or a proper squeeze from the closed liner. These teats receive insufficient relief from the milking vacuum.
- **Compressive load.** The effects of compressive load applied by the closed liner is illustrated in the Figure on next page (Mein & Reinemann, 2009), and involves an interaction between vacuum, pulsation settings and liner design (Penry *et al* 2018). Very short teats get little or no squeeze, especially if the mouthpiece cavity is too deep. Some long teats also get little or no squeeze because the liner cannot collapse beneath the teat-end

Final selection of the 'right' liner

Final selection is always better done on the farm. Check the milking performance of liners on your 'short list' using the five key milking-time observations described in this Technote.

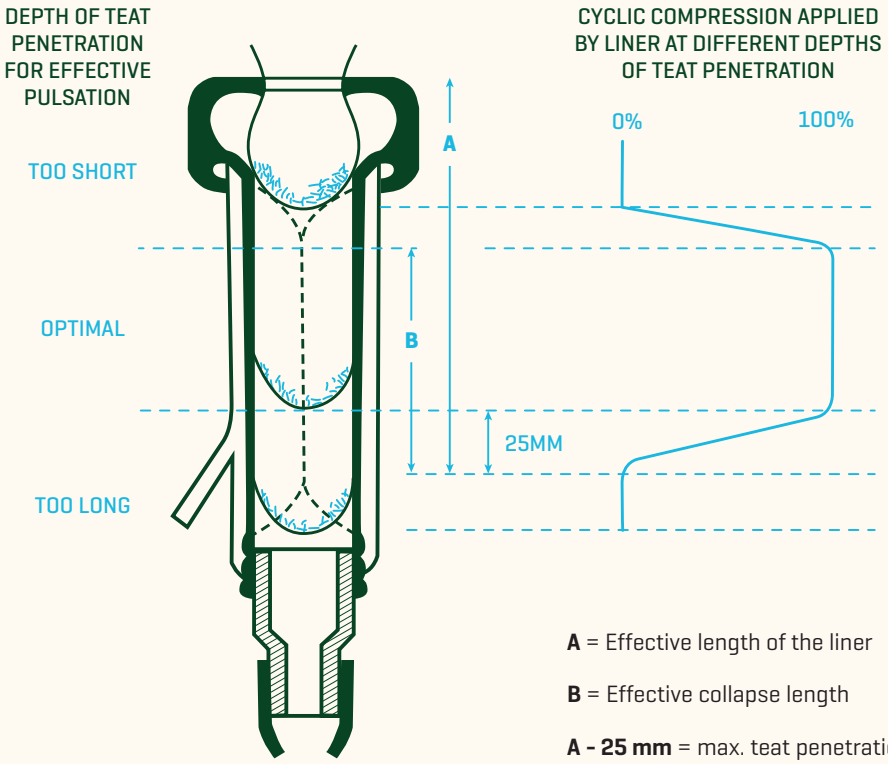
Measurement of the effective length of a teat cup liner



Effective length of liners (EL=L-IL)

Ineffective length (IL) can be measured by removing one liner from its cup and connecting it to the milking machine vacuum while sealing the mouthpiece (e.g. with the palm of a hand). Mark the lowest point on the liner barrel where the two sides are flattened against each other (point C). Measure the distance from point C to the point on the liner tensioning ring (point B) which will be in contact with the bottom of the teat cup shell.

Degree of compression applied by a closed liner around teats that penetrate to different depths within a liner. Effective pulsation occurs when the teat end remains in the 'Optimal' region.



A = Effective length of the liner

B = Effective collapse length

A - 25 mm = max. teat penetration for effective pulsation

A - B = min. teat penetration for effective pulsation

5 Milking machine testing and servicing

Regular testing and servicing are essential to maintain effective machine performance, optimise milking speed and completeness, and reduce mastitis risk. Routine monitoring of key milking-time indicators, such as teat condition, cow behaviour, milking time and completeness, teat cup slips and falls, provides early warning of emerging problems.

Do not rely **solely** on an annual service. Most milking machine servicing companies offer in-season test procedures for liners, vacuum and pulsators. Additional testing and service should be carried out immediately if:

- cows milk slowly or incompletely;
- teat cups slip or fall frequently;
- teat condition deteriorates; or
- cows show signs of discomfort during milking.

⑥ Use a milking machine technician who tests to NZMPTA standards

Machine tests should be performed and reported by technicians holding a current New Zealand Milking and Pumping Trade Association (MPTA) testing certificate.

Milking machine tests have been classified into five types (International Dairy Federation, 2000):

1. Physical measurements

This is conducted without the machine running and assesses system dimensions and component specifications, such as length, diameter and slope of pipelines, and weight and volume of clusters. It should be performed during an installation, after a major upgrade, or to ensure compliance with a contract of sale or service.

2. Dry test

This is performed with the machine running but not milking and involves assessment of vacuum and airflow measurements. This type of test has been described loosely, but incorrectly, as 'static testing'. It includes tests of vacuum levels and fluctuations in various parts of the system, vacuum pump and reserve capacity, and testing of pulsators. The standard MPTA test procedure is a comprehensive series of dry tests plus some physical measurements.

3. Wet test

This is performed with the machine running, with air and liquid (water, milk, or artificial milk) flowing through the machine. Equipment manufacturers or testing authorities typically perform wet tests in a laboratory, to assess vacuum level and fluctuations in pipelines and clusters, vacuum drop across components, and performance of automatic detachers and milk pumps.

Some wet tests may be suitable for on-farm diagnostics, for example, use of an artificial udder connected to one or more milking units to diagnose problems with slow milking or frequent cup falling, or to optimise system vacuum settings (Stewart *et al* 1996).

4. Cleaning-time or wash test

Wash tests or cleaning in place (CIP) tests assess wash system performance for the milking machine or bulk tank. They include tests of temperature, chemical concentration, water quality, flow rates and cycle times, and should be conducted when a new cleaning system is commissioned, or when quality grades or cleaning problems arise.

5. Milking-time or performance test

Milking-time tests describes observations made during milking and provides the most direct indicator of performance of any milking system (Mein 1992).

In NZ, performance testing is often undertaken by an NZMPTAregistered technician in collaboration with a veterinarian trained in milking performance and teat condition assessment.

Key machine-related tests include:

- mean vacuum and fluctuations in the milkline.
- vacuum and fluctuations in or near the receiver (unless milkline vacuum recording indicates changes of less than ±2 kPa); and
- claw vacuum during peak milk flow.

Practical assessments of the machine-cow interaction include:

- teat condition score immediately before and after milking
- cow behaviour:
  - any signs of discomfort (Kick Step or KiSt response) during cup attachment or removal?
  - are teats unusually sensitive to touch after milking?
- frequency of liner slips and cup falls requiring corrective action
- average milking time per cow relative to yield
- amount of 'available' milk remaining when cups are removed.

➜ **Technote 9** summarises changes in teat condition that may be seen when milking machines or liners are not performing optimally.

Use the **DairyNZ Mastitis Investigation Kit** record sheets to systematically record milking time observations. Practical vacuum measurements should be undertaken:

- within one month of commissioning a new system;
- after major servicing or upgrades; and
- whenever problems with milking speed, completeness, teat condition or cow behaviour are reported.

7 Obtaining a technician's report

In NZ, milking machines are tested using a dry test, modified from the recommendations in ISO 5707:2007 (ISO 2007b). This involves carrying out basic testing, then disassembling the machine into its separate components. As the machine is re-assembled, airflow tests are conducted as each component is re-connected. At the completion of the test, the machine should be fully re-assembled and working as it would normally.

The tester's reports should include:

1. Visual Faults Check

The Visual Check involves assessment of the way the plant has been installed, compared with industry and OEM (original equipment manufacturers) guidelines. It should include the way the machine is mounted, pipeline sizes, liner/shell compatibilities, milkline slope, drain points, obvious maintenance problems and obvious safety problems. Faults are marked with a cross (X) and comments or recommendations carried forward to the Summary form.

2. Test Report

The Test Report is used to record required performance tests, such as airflow and vacuum readings, vacuum pump and releaser milk pump tests and tests of the machine's vacuum gauge for comparison with industry and OEM standards. The Test Report should also include pulsation tests, with graphs attached.

3. Summary

The Summary form is used to provide clear recommendations for each fault identified. These should be brief but clear enough for either the farm manager or a subsequent machine technician to understand and rectify.

Ensure that identified faults are fixed promptly and the date and details recorded for future reference.

Acknowledgements

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Disclaimer

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