Dairies, Equipment, Cleaning & Maintenance

Milk Froth

Frothed milk is damaged milk which can become rancid and the fat percentage is lowered by fat damage. The causes of milk frothing are many and varied and can slow milking, or be so bad that the system fills with froth and the clusters fall off. Causes of froth include -

- Gases in the milk before it leaves the cow during the spring flush (bloat period). At this time a slight problem listed below can aggravate frothing.
- Clumsy cluster application and removal. Many milkers hold the claw too low while applying shells, so allow air to gush in. This also causes teat blasting, damaged fat globules, and vacuum variations.
- Excessive air admission bleed holes, caused by holes being cleaned with the wrong tool, or being drilled out too large. They should be 0.9 mm diameter or equivalent area, but check with your supplier.
- Air admission hole below the level of the milk in the claw, which includes any claw that floods.
- Milk line inlets twisted down, so that air bubbles through the milk, instead of entering from the top of the milk line.
- Incorrect liners, causing cup slip.
- Air leaks between the liners and chapped teats. Teat spraying improves teats so reduces this.
- Breakdown and puncturing of the short milk tube (liner) where it joins the claw.
- Failure to maintain claw gaskets in good condition.
- Too long a milk tube in high-line installations, resulting in undue sagging below the cow, which can cause "milk plugging" and surging which can lead to cup slip with resultant leakage, and also acceleration of milk into the pipeline.
- A long lift up to an over high milk line.
- Perished and damaged ends of long milk tubes, which allow air leaks into the milk stream.
- Perished or old rubber flattening where the milk tube joins on to the milk line entry inlet, causing very high velocities to inject milk into the main milk stream.
- Too small a diameter milk pipe.
- Incorrect slope on the milk pipe.
- Loose milk pipe brackets allowing some of the line to twist downwards, so that inlets are no longer on top.
- Loose unions on the milk pipe line allowing air leaks.
- Violent milk entry into the receiver caused by surges after plugging on small diameter milk pipes and/or excessive air entry through sloppy cluster application.
- Diaphragm pump turning too fast so churning milk.
- An obstruction (small stone, hair, etc.) under a milk pump valve.
- Centrifugal pump churning, due to over-pumping from faulty milk level control.
- Air leaks in the non-return valve.
- Air leaks in the shaft seal.

- Poorly designed automatic cluster removers that let air into the system without the benefit of an automatic shut-off milk tap in the claw or removal unit.
- Leaks in cluster removers.
- Over milking, during which time the fat-rich strippings are literally churned or rolled up the long milk tube and dropper to the milk line.
- Milk from the delivery line cascading into the vat (tank or silo), causing splashing. It should enter from below the milk already in the vat or run down the side.
- Warm milk (without adequate precooling) pouring into chilled milk from the previous milking.

Frothing is worse where milk has to be sucked a long way, so position the milk receiver and pump above the centre of the herringbone pit, and just high enough to walk under it, or in the centre of the rotary.

Cleaning

All traces of milk must be thoroughly rinsed out of the plant with cold water before the hot water and detergents are used, or the milk remaining will be baked onto the plant, and worse, the milk will reduce the effectiveness of the detergent. With some large bore milk lines it is necessary to remove the end plug and wash the milk out with the wash down hose.

Rinsing all the milk out is the least costly of the cleaning operations, but is one of the most neglected.

Important points are the duration of wash water contact with the plant, temperature, turbulence to get into all the corners, and adequate concentration of detergents. The less of one, the more is needed of another.

Washing milking machines takes about a dozen operations, all prone to mistakes and variations, and detergents and hot water are too expensive to use inefficiently. With automatic in-place-cleaning the possibility of mistakes is reduced, and detergents and hot water are fully used for thorough washing. New cluster cleaners with spray heads hold the shells without deforming the liner openings, and an alarm warns of any problem, for example no water, low temperature, etc.

An electronic flushing pulsator speeds up the flow of washing water to about 40 mph, which increases turbulence and gives a water blasting effect for better cleaning of milk lines. The new electronic type has a higher capacity with precise electronic timing, to cater for larger milk lines. It injects such a large amount of air that a large plug of water is forced down the milk line, filling it and helping to wash the receiver. The in-place-cleaning line is connected through a blank-end cleaner to give a constant flow of wash water.

Detergents and acids are available for most water types, but it is important to use non-frothing detergents, to prevent the removal of oil from the vacuum pump.

Cold water washing systems usually fail with time.

Poor cleaning may permit the growth of pathogens on liners between milkings, whereby the liners themselves serve as a source of infection. Old liners are much worse in this respect.

Acid is an excellent cleaner of stainless steel, but doesn't remove fat from the rubber, which then deteriorates, so use alkali cleaners as well. The detergent supplier should have a wash program to suit your water.

Milking can be pleasant, but scrubbing walls, rails and yards is not, so, where appropriate,

dampen them before milking and keep them wet, install water jets on the backing gate, self-tipping 200 litre (50 US gallon) or larger drums, water jets on the bottom rail of the backing gate and yard, milking machine cleaning in place, and, in Turn-Styles, fixed water jets to wash the clusters and whole bail area as it rotates.

Remember when deciding on the type and size of the milking machine, that the larger they are the more cleaning time and water required twice a day.

During cold weather rinse the plant with tepid water, then put about 5 litres (one gallon) of hot water per cluster through to warm it up to save the detergent wash cooling as quickly. Washing water that goes cold starts depositing scum, and can result in mineral and milkstone build-up. With most detergents the wash water should be dumped before it drops to 65° C (150° F).

With today's detergents and washing facilities we should not get poor cleaning grades, and more importantly we should be aiming to produce cleaner and better milk to help our dairy company increase our payouts.

Modern detergents are somewhat stronger and more effective than older ones, so when first using them they release any layers of milkstone and other deposits which may have built up.

These loosened deposits may come free during milking and cause thermoduric grades which are not caused solely by old rubberware. Protein buildup in the plant and tank can cause them. To prevent these, carry out the following **before** starting.

Don’t use nitric acid on rubber because it can damage it give off carcinogenic fumes.

Grades can occur from Senses (smell, taint, etc.) from brassicas eaten a few hours before milking, and weeds such as land cress and Pennyroyal.

Cleaning or covering bugs?

Milk grades can be prevented at very little cost. In some cases instead of aiming at more thorough cleaning, stronger sanitising detergents have been used to reduce grades and to cover up protein and mineral deposits. However grades eventually occur because the protein or mineral layers which are not washed away, build up and break away during milking.

Most problems are firstly operator, secondly mechanical, and very few chemical problems.

Calculating the Tub Size

For the correct amount of water to be put through, we must know the size of the tub. If we believe that it is 100 litres but is less, inadequate cleaning will result, and equally if it is larger than believed the detergent solution will be too weak to wash effectively.

The formula for a round tub is 3.14 times radius squared, times the depth of water. If the tub tapers the radius (half diameter) must be the average or measured across the centre.

If all measurements are made in centimetres, the result should be divided by 1,000 to give litres.

Write the size and quantity of detergent on your Wall Chart.

General

Earlier recommendations were to use 2 litres of cold rinse water per cluster. It then crept up to 5 litres, now 10 litres is the recommendation, and for good reason.

Check the Temperature

Check the hot water temperature which should be 85°C* and ensure that the cleaning solution doesn't drop below 65°C. If it does it will allow the re-depositing of fat. If using iodophor water temperature used should not exceed 55°C.

Essentials

1. The National Dairy Laboratory recommended volume of washing solution is 10 litres per cluster for third line systems.

2. Temperature is necessary to help kill bacteria, help the detergent work faster and help remove fat from stainless steel and rubber.

3. Velocity gives a good scouring effect on the stainless steel.

4. Time, to allow the detergent to remove milk and to allow the temperature to help kill bacteria.

5. Detergent concentration, to clean and sterilise. Measure detergents carefully, and record the volume of your tub. Always follow the manufacturer's recommendations exactly.

Plate Coolers (Heat Exchangers)

Many US milking plants don’t have heat exchangers (coolers), but in dairy produce exporting countries they are obligatory. In New Zealand milk quality is paramount to secure export markets, so is cooled quickly and collected once or twice a day. Milk has be cooled to to 18° C (64° F) or less, before entering the refrigerated milk tank. Water used for cooling can be at about 16 degrees celius and cool the milk to 18 degrees. The large volume of water required to do this is then used for washing. If two tanks are used, fill each half way at each milking to allow faster chiller cooling. Water should flow at two and a half times the milk flow.

Naturally water flow through these should be switched off prior to the hot wash water being circulated.

Damaged rubber gaskets can harbour bacteria, so should be replaced.

Damage in the way of stress cracking can occur if plates are over tightened. Hot water on an over-tightened plate cooler is a ticket to disaster. Excessive use of a chlorinated sanitiser or chlorinated alkali, followed by inadequate rinsing, followed by an acid sanitiser, will eventually lead to chloride attack - corrosion of the stainless plates. Cooling water, if contaminated, can then enter the milk and cause grades.

A milk grade costs about 16 cents per kilogram of milkfat, which can cost a 150 cow dairy farmer as much as $25 a day. As well as this, it costs the dairy company much more, from lost sales through inferior products.

Having the misfortune of three grades in a row costs double rates, or a total of $150, which is the value of 60 litres of detergent, so trying to economise on the amount of detergents can be expensive. These figures make it obvious that every precaution should be taken to avoid grades by using the correct quantities of the best possible cleaning system.

There are strong acid and alkaline detergents designed to assist in this regard. The best have wetting and anti-deposit agents and a very high pH to ensure excellent bacterial kill.

Five minutes (if using IPC) is about the maximum time for recirculating. Temperature

should not get below 65 degrees Celsius. To check this record the temperature of incoming water which makes up the IPC solution. Then check every minute during the IPC cleaning for 5 minutes, when the temperature should still be above 65 degrees C. Record the air temperature and keep in mind that on a colder day the temperature drop will be greater.

Ensure that you and your staff know the exact size of your water tub so as to use the correct amount of water and detergent.

If it is believed to be 100 litres but is only 70 litres then 45 mls of detergent could be wasted each time. Equally important if the tub is actually 130 litres and 150 mls is used then the strength of the chemical is too weak.

If there are leaks causing a volume decrease in the cleaning solution, the soil loading in the solution may become so high that it starts to re-deposit onto the machinery. In other words a minimum cleaning solution volume is necessary to clean effectively.

Write the size and quantity of detergent required on the tub and on the wall with a marking pen.

Foaming detergents

Acid detergents in particular can remove oil from the vacuum pump so use low foam detergents.

If foaming is excessive it can be caused by the detergent not being a low foam formulation, air leaks, the solution getting too cold, or milk pollution of the cleaning solution through inadequate pre-rinsing.

Foam has little cleaning effect and is much cooler than the water it sits on. It has no viscosity (mechanical cleaning ability) and can act as a depositor of scum from the wash water.

Cleaning a dirty plant

1. Rinse thoroughly with 10 litres per cluster of tepid water.
2. Wash the plant thoroughly after morning milking with a ten times strength of alkali in 85° C (185 F) water using 10 litres per cluster.
3. Rinse thoroughly with 10 litres per cluster of tepid water.
4. Once the water has heated up again to 85° C wash the plant with ten times strength of acid in 85° C water using 10 litres per cluster.
5. Rinse thoroughly with 10 litres per cluster of tepid water.

During each wash, brush the areas where cleaning solution doesn't reach, especially the inside tops of receiving cans. Be careful not to splash detergent into eyes - wear safety glasses and gloves. Leave the brushed on detergent long enough to soften any deposits before rinsing.

6. Read the labels for normal washing instructions.

In-place cleaning

Jetters should be adjusted so that all receive the same flow of water and should face upwards to draw the water up, filling the cluster.

Ensure that all claw sight glasses are filling adequately with cleaning solution and with good agitation.

The third line should slope downwards to the last set of cups. This helps ensure that all the milk line and the last set of cups receive sufficient cleaning solution.

The cleaning solution should be dumped before the temperature drops to 65°C. Use a

thermometer to monitor this so that fat and minerals don't start re-depositing.

Using a flushing pulsator, especially on large milk lines, will speed the flow of water to about 60 kph so filling the milk line, and giving an excellent scouring effect.

Mechanical action is very important in the cleaning cycle.

A flushing pulsator increases the washing effect within the receiving can, but the top will still need brushing with a strong detergent.

Any colouring of stainless steel indicates dirt. A protein build-up is identified by a "rainbow hue" on **dry** stainless steel. The receiver and vat are places to see this.

Thermodurics can be found in this protein layer, and also under milkstone. The latter is identified by a grey film on **dry** stainless steel.

Regular washing programme

A few years back there was a swing to six day acid sanitiser cleaning. Unfortunately, this practise can best be described as a cover-up.

Acid detergents don't effectively remove protein. Strong alkali is required to do this. The strongest alkali is sodium hydroxide (caustic) which is the base of many alkali detergents.

Frequently farmers have to change to using more alkali to remove the protein build-up.

Use full strength cleaning after both milkings otherwise thermoduric bugs multiply in slightly dirty conditions.

Cost Savings

This procedure costs less and the high pH of a good alkali detergent kills bacteria and removes the fat from rubber. It also contains ingredients to reduce milkstone build-up.

One disadvantage is that alkalis must be rinsed out thoroughly and immediately after use. However the benefits of this system are considerable and include longer rubber life, because acids don't remove fat from rubberware.

If water quality is poor and requires a sanitiser like iodophor to finish with, it will still cost less than using the more expensive acids.

When using poor quality water, add a small amount of iodophor to the last tub of rinse water, as a sanitiser.

A USA dairy farmer wrote, “We are pleased with the switch to the NZ style milk plant cleaning routine and are saving almost US$15.00 per week in cleaners and in electricity.”

Pre-Clean

When changing to any new improved detergent, it is important to pre-clean your plant to remove previous build-ups because good detergents being stronger and more effective than others, release any layers of milkstone and other deposits which may have built up. These loosened deposits may then come free during milking and cause thermoduric grades.

To prevent this, carry out the following heavy duty wash before starting, whenever a grade occurs and before the start of each season.

Heavy Duty Wash

1. Rinse all milk out thoroughly with at least 10 litres per cluster of tepid water.
2. Use either alkali or acid in water at 80°C at 10 litres per cluster. In both cases drain before the temperature drops to 65°C.

3. Rinse with 10 litres per cluster of cold water and drain.

Note: After steps 2 and 4, brush the areas where the cleaning solutions don't reach, especially the inside tops of receiving cans. Be careful not to splash detergent into eyes - wear safety glasses and gloves. Leave the detergent on long enough to soften any deposits before rinsing.

Remember that a clean plant can't grow bacteria and that it should be dry, so ensure it is drained completely.

Cold Water Washing a No-No

Cold water washing, done correctly, costs more than hot water washing because it uses more detergent. Grades which are more frequent occurrences with cold water washing cost a lot more than power to heat water. Hot water kills coliforms.

Some companies in promoting cold water washing in the past did themselves and the industry a disservice. The companies concerned increased their detergent sales at the time, but subsequently lost sales and repute, when grades occurred and they had to ask that farmers using cold water washing to hot water wash twice a week. The fact that this was necessary shows that cold water washing is not reliable.

The above should not be confused with **cold water rinsing** and adding a sanitiser like iodophor.

When changing to a new more powerful detergent it is important to pre-clean your plant to remove any previous build-up. Otherwise when you start using them you will find that they soften any layers of milkstone and other deposits which may have built up. These loosened deposits may then come free during milking and cause thermoduric grades. To prevent this, carry out a heavy duty wash before starting on your new detergent programme, and again whenever a grade occurs and before the start of each season.

Remember that a clean plant can't grow bacteria and that it should be dry, so ensure it is drained completely after every milking.

Washing the Parlor & Yards

Yard washing can be automated and the wash water can be sprayed onto at least 4 ha (10 acres) of pasture per 100 cows by travelling irrigator. The irrigation system, at a cost of about $3,000, can pay for itself in five years in saved fertiliser, without allowing for saved labor. Unfortunately, large amounts of water can’t be used for cleaning in freezing conditions.

Most of our wash-down hoses are 38 mm (one and a quarter inch) with special nozzles which I believe are now available in most countries. Some farmers have volume washing whereby a large valve is opened at the bottom of storage tank which holds the cooler (heat exchanger) and water gushes out and across the yard. Some yards have 200 litre (55 US gallons) drums or barrels on the yard rail which are tipped over automatically when full, or manually.

The wash water and effluent run into a sump via sand and debris traps. From there effluent is pumped onto pastures through travelling irrigators. Volume washing requires storage ponds to hold the washings because a normal pump and irrigator can’t spread it in the few minutes that it takes to empty.

Storing the effluent in any form before irrigating it is wasteful, polluting (smell and

leakage), and if stored for months can kill soil life.

Mastitis

If the incidence of mastitis is high at calving, suspect a dirty calving area and poor dry cow therapy. If it increases as the lactation progresses, suspect a faulty milking machine and/or procedure.

Milk plugging in the sag of the long milk tube can cause variations in vacuum at the teat, which is a recipe for unhappy cows and mastitis.

To reduce the chance of bacteria entering the teat, it is best if cows don't lie down or be subjected to mud or dust for some time after milking when the teat orifice is still open.

As well as high vacuum causing mastitis, if the vacuum is too low, milking time will be extended, which may increase teat damage and mastitis.

Machines must obviously be correct. There are some farmers with old slide pulsators who don't think it is necessary to have their milking machine tested. However a farmer with slide pulsators complained to me about how long it took him to milk, so I checked his pulsators by putting my thumb in during milking, and was horrified to find that they were set at about 30:70 (30 milking phase and 70 rest phase). He put his thumb in and said, "No, the squeeze is about 70% and the release 30%", but he didn't realise that the squeeze is the rest time, and when there is no squeeze the milk is being sucked out of the teat.

A discussion followed, but I assured him that it was when the air was allowed in behind the liner that the rest occurred. He agreed to get his milking machine serviced, after which a faster milking time and improved udder health soon paid for the cost.

Pulsation speeds of 75 pulses per minute have increased mastitis infection, while a rate of 40 has been shown to cause cow discomfort. Goats and sheep need faster pulsation rates.

Teat damage is known to occur in the event of machine faults, such as vacuum fluctuation, faulty liners and over-milking.

The cost in lost production and udder problems can be high, and the fault will someday have to be fixed, so get the machine checked at least annually, and upgraded when necessary.

A vacuum level of 51 kPa in a high line led to an increase in mastitis. At high altitudes above 500 metres (1,600 feet), the vacuum level should be lower than normal.

Incorrect liners and small restrictive claws are major causes of shell slip. Increased mastitis infection rates are associated with increased shell slip.

The longer the clusters are on the cow, the more mastitis. One slow milking teat can cause other teats to get mastitis if they are over-milked, so avoid twisted clusters caused by cows not standing in the correct position.

Bill Chynoweth had a cow which was put in the bail and then not milked for a quarter of an hour, because the herd tester was late. The next day she had oedema (liquid under the skin in front of the udder), the udder was badly damaged, and she got mastitis so badly she had to be culled. Others have examples of bad mastitis after cows let their milk down and are not milked straightaway.

Checking for mastitis without squirting is much easier than at first thought. When applying shells, hold them with the bottom of the hand so that the forefinger and/or thumb touches the top of each teat and udder. You will usually notice heat, inflammation, hardness or soreness. Also look at the udder for swollen quarters before and after milking.

At calving squirt each teat before milking until the colostrum period is over which is at

least eight milkings. Most mastitis occurs at calving and drying off so those are the times to check regularly. For the rest of the year one should not get more than 4% getting mastitis.

See Milking > Mastitis

Somatic Cell Counts

Modern milking machines are sophisticated pieces of equipment which need twice, or at least once, a year servicing. Failure to do so can result in repair costs far greater than that of servicing. Correcting some plants has achieved a 15% increase in production and has improved the cows' and farmer's outlook towards milking. Mastitis can be reduced, somatic cell counts lowered, and milking changed from a pain to a pleasure.

Herd test somatic cell counts for each cow and daily bulk ones from the co-op help warn of mastitis increasing. When my brother in South Africa bought new pulsators from New Zealand his milking time shortened and his somatic cell counts dropped.

Other factors which influence milk quality are feeding and stage of lactation. At the end of lactation over milking is liable to increase, increasing fat damage and somatic cell counts. Our companies want counts below 150,000, and are penalising at 400,000. In Europe it is 500,000, but all countries are lowering the allowable maximum.

Controlling flies in the parlor and on the farm improves milk quality because they increase somatic cell counts and spread mastitis when they go from dirt to teats and from teat to teat. See Animal Health, Flies.

Towards the end of lactation change to OAD before milk production dropped too much in milk production (still producing about 75% of peak) and before the somatic cell count has gone up too much and while there is still ample pasture to feed well.

In 2006 a SCC milking machine measurer was developed by Sensortech in Hamilton, New Zealand. About 30 seconds after applying

See Milking > Mastitis

Water

Water should be checked for contamination, coli, hardness, iron, manganese, etc., and corrected where necessary.

Bulk storage tanks should be kept clean.

Even if you have soft water don't think that you can reduce the detergent rate because the sanitising effect and pH of the washing water will be reduced.

A food is being produces so there is an obligation to filter and treat the water because milk is a food, and no other food production business would be allowed to use "bad" water for washing utensils. See chapter on Water.

pH Scale

Another reason why the amount of water must be known is to ensure that the pH of the washing solution is correct so as to achieve the correct cleaning action.

The pH scale reads from 0 to 14, with 7 being neutral.

When diluted in water strong acids give a pH of around 2 while strong alkalis give a pH of around 13.

The reason for using the two extremes is because milk contains a number of fractions in its make-up with the mineral and fat fractions being those which concern us.

The mineral portion causes the deposit that we know as milkstone. This film starts to form within 10 seconds of milk coming in contact with a stainless steel surface.

Acids remove milkstone deposits, however, before milkstone can be removed, there has to be a change in its pH value to make it soluble. The pH of milkstone approximates pH 6.4 and at this pH the milkstone is insoluble. By using an acid the pH becomes 2 and the milkstone becomes soluble.

Similarly with the fat, by using a strong alkali with (some have other chemicals too) the fat becomes soluble, and in a dispersible form.

Don’t Buy Cup-slip

Cup slip can increase SCCs and mastitis.

Before buying new liners, ensure that they are the best for your herd and shells. Cup slip should not occur except on very badly shaped udders. If there is slip on more than 2% of cows, then your cups, claws or milking machine need remedying. Low vacuum frequently gets the blame and vacuum pumps are replaced, but it is quite often the cup slip which causes the low vacuum.

Correct vacuum levels, correct liners, 2 + 2 pulsation and full flow claws are the first things to try. If you are unable to cure the problem, then ask a certified milking machine technician with a practising certificate, and if he can't solve the problem then get a second opinion, because it can be fixed.

Clusters should hang evenly, and the long milk rubbers must leave the claw horizontally from average height udders and then slope gradually upwards.

Many milking machine brands have come and gone, so it is important to choose a quality one with speed of milking from a solid, established company.

Correct liners and full flow claws are the first things to try.

If you are unable to cure the problem, then ask a certified milking machine technician with a practising certificate, and, if he can't solve the problem, get a second opinion, because it can be fixed.

Dairy farmers have a wide choice in liners, and there is also a variation in prices because the quality of liners varies considerably, depending on the quality and quantity of material used. This ranges from rubber to synthetics in varying thicknesses.

Some liners are advertised to fit such and such a cup, but they may not fit, and, worse still, they may not milk well.

There are cases of farmers purchasing liners, and then having to return them because they didn't fit quite correctly, and wouldn't fit on the jetters of their In Place Cleaning system - if you don't discover this until after you have used the liners, you are unlikely to be able to return them.

Hard and fast recommendations can't be made in an article like this, and that is why purchases should be made from a recognised milking machine agent, who usually has details of your plant and a wealth of experience to back up his judgement.

Not all claw tubes are suitable for all clusters, so again care must be taken.

Many milking instructors who are called in to solve mastitis and other problems find miss-matched liners.

The problem is serious, said one instructor, but should never occur, because there are enough milking machine agents and service people to give the correct advice.

Another problem milking instructors find is rubberware which is too long. Not only is this a

waste, but it also pulls one side of the cluster down, to give uneven milking.

This causes variations in vacuum at the teat, which is a recipe for cup slip, unhappy cows and mastitis.

Milk plugging in the sag of the milk tube causes vacuum fluctuations and fat damage as the air bubbles through the milk. Milk tubes should come out about level from the average cow and then rise upwards to the dropper. If the dropper is too long this can't happen, so shorten it.

Correct Liners Imperative

There are liners for Jerseys and liners for Holsteins, and liners to fit each particular shell. Mix any of these and there can be problems - and severe ones, like mastitis, cup slip and jittery cows, resulting in lower production.

The solution to the problem is easy - know which shells you have, and then purchase a reputable liner from a reputable company. They should know your requirements, are working with them day and night, and will stand by their products and decisions.

Teats stretch up to 50% under vacuum, so the liner must be long enough to allow for this.

Very short teats can’t stretch and if under 35 mm long can be a problem because the liner can’t collapse properly and give the teat massage. Select cows and bulls with teats at least 60 mm long.

If they say that your shells are a problem then look into upgrading them - they could be 30 years old, and milking machines have come a long way in that time.

Coliform and thermoduric grades can be caused by old rubberware.

Those using **good** clear silicone liners and tubes seem very happy with them. They allow one to see the milk from each quarter, last a long time, are soft even in cold weather, don’t crack, perish or become porous, clean up well so don’t hold bacteria, however, like plastics, not all silicone is good.

Liners, Shells & Claw Tubes

Make sure that you use the correct liners for your shells (cups). If they are not right, they will not fit correctly, so could twist, chafe or stretch, so will not milk efficiently. A perfect fit is essential for good performance.

Correct, effective length liners allow complete closing of the liner below the teat, to give adequate teat relief between milk extraction phases.

Check that there are no sharp nipples or rough edges on the shells or claws, that could damage the rubber. Keep grease and teat salve away from them.

There is a wide choice in liners, and there is also a variation in prices, because the quality of liners varies considerably, depending on the quality and quantity of material used. This ranges from rubber to synthetics. Being one or the other doesn’t guarantee quality.

Some liners are advertised to fit such and such a cup, but they may not fit, and, worse still, they may not milk well.

There are cases of farmers purchasing liners, and then having to return them because they didn't fit quite correctly, or wouldn't fit on the in-place cleaning jetters. If you don't discover this until after you have used the liners, you are unlikely to be able to return them.

Hard and fast recommendations can't be made from an office, and that is why purchases should be made from a recognized milking machine agent, who preferably knows your plant, and

usually has a wealth of experience to back up his judgment.

There are liners for Jerseys and liners for Friesians, and liners to fit each particular shell. Mix any of these and there can be problems - and severe ones, like mastitis, cup slip and jittery cows - resulting in stress and lower production.

Teat ringing can teach a heifer to kick the cluster off. The softer mouth piece of the latest liners results in less crawling and less throttling of teats at the end of milking, so don't tolerate teat rings, and don't expect first calvers to suffer.

When applying clusters the new liner wire shutoff system and lighter teat cup shells cause them to hang higher, so they are more easily grabbed for quick application. Users say that the cluster handle and the shells seem to be in the right position for their hands.

Modern shells are partly stainless steel and partly improved plastic, giving a lighter cluster weight of only 1.6 kg (3.5 lb) complete, compared with up to 3.2 kg (7 lb) for some, allowing lower vacuum levels. These features reduce the likelihood of blue teats, a sign that mastitis and worse problems will occur.

Even claw tubes are not always suitable for all clusters, so again care must be taken. If the machine contains a variety of incompatible components, then it will pay to correct them, because unmatched cups and liners and the old short liners can cause mastitis.

The Claw

A certain amount of air is required to enter the milk, in order to move it away from the claw and into the milk line, recorder jar or bucket. However, if there is an excessive amount of air in the milk, the milk will be accelerated, and in most cases rolled up the long milk tube to the milk line.

The best claws have a large volume, so they don't flood, resulting in smooth milk flow without vacuum fluctuations. and the milk flow should be visible from all angles (360° visibility).

Laboratory tests show that there is no back flow or teat impact with the latest claws at a flow rate of 11.4 litres (25 lb)/minute. Twenty pounds/minute is the maximum rate of fast-let-down cows. There are fewer vacuum variations, increased milk flow rates and little risk of teat-end impact.

The claw nipple that the liners go over in conventional claws is a milk restrictor. The new clusters have eliminated the nipple by having a simple grommet type connection, whereby the liner milk tube goes right into the claw body. Liner milk tube damage is less with this system.

Milk enters from the top circumference of the claw, goes to the bottom and then leaves via a vertical tube out the top. A flow bulb in the claw, as seen on the front of modern ships, smooths the movement of liquids.

The bottom of the milk droppers (to high milk lines) should be 500 mm (20 inches) above where the cows stand. Milk and pulsator tubes should not sag, but should slope from the claw on an average height cow, gradually upwards to the bottom of the dropper or bucket inlet. Excessively long tubes and droppers are wasteful of money when buying them, and of vacuum at each pulsation, slowing down the pulsation changeover phases. Sagging tubes can cause plugging and teat-end blasting.

Pulsators

As well as the ratios described above, there are 2 + 2 and 4 + 0 pulsation systems. The latter on a high line cause vacuum variations between 23 and 50 kPa (7 to 15 inches of mercury), while

with 2 + 2 it is only from 37 to 50 kPa (11 to 15 inches), and with modern large high flow claws the variations are even less. Cows don't like variations.

Milk Line Height & Vacuum Levels

Vacuum levels with good clusters should be no higher than 40 kPa for low lines, 44 for high milk lines 1.4 m above where the cow stands, 46 if 1.6 m and 48 if 1.8 m high. Vacuum levels may have to increased or decreased during testing, depending on the height of receptacles.

Milk should be treated as gently as possible, and air velocity kept to a minimum, by the use of large diameter milk lines. They should have adequate fall and not sag, which can lead to milk plugging and surging. Milk line inlets should be 19 mm (3/4") and point slightly upwards and away from the milk receiver, and be near the top of a large diameter milk pipe, so that the milk enters and goes downwards and towards the receiver.

Long lengths of pipe expand and contract during washing and milking cycles, and ultimately the seals of joining unions will become hard and dislodged, thus allowing air leaks directly into the milk stream. Regular attention must be paid to all rubber seals and gaskets in the milk and vacuum systems. Leaks in a positive pressure system will show up as liquids dripping on to the floor., but leaks in the vacuum system are very hard to locate, and will usually show up only during a machine check using air flow measuring equipment.

It is preferable to apply clusters nearest to the milk receiver first. If the furthest ones are applied first, the milk line gradually fills as the cups close to the receiver are applied, then when closer clusters are applied, air jets through the milk in the full pipe causing froth, and damaging fat globules.

Milk Receiver

The milk receiver in most cases has the function of separating out air that enters the milk line with the milk, and also transferring milk from a partial vacuum to atmospheric pressure.

It should be of adequate capacity to cope with peak flows from the plant when the milk pump is operating at normal speed. Enlarging receiver cans frequently saves buying a larger milk pump, and also reduces vacuum fluctuations.

The milk receiver and pump are best located in the centre of a herringbone pit of large parlors (16 cows or more), rather than in the milk room, because milk is better pumped under slight pressure than sucked under vacuum. With small parlors the receiver can be at the milk room end of the pit, next to the first cow , and lower because it then need not be walked under. Protect the pipes where they cross to the milk room to avoid cows in season damaging them.

Milk Pumps

These should run no faster than necessary or fat damage will occur. Any milk pump can exacerbate a mild foaming problem into a major buttering problem, if allowed to run dry and pump air through the milk in the delivery line, causing a buttering effect. Once you start milking, keep going, to reduce this fat damaging effect.

Many pumps are installed and operated at a speed that has to handle the flow of milk from the herd during the peak period, or to handle the wash water, which means pumping air during the lowest production period. All milk pumps should be centrifugal or rotary types and be fitted with level switches to avoid this.

Milk pressure will be increased if any of the following are allowed to occur -

- Filter sock getting blocked.
- Milk cooler (heat exchanger) restricted with foreign matter from a burst filter sock.
- Milk stone and mineral build-up on the cooler plates.
- Flattened or deteriorated gaskets in an over-tightened cooler.
- Twisted or doubled up rubber elbows or rubber sleeves.

The above are operator faults. Limiting factors within a milking machine can include -

- Undersized milk filter.
- Undersized cooler.
- Undersized pipes before and after the milk pump, filter and cooler.
- Badly assembled unions which have allowed cone seals to dislodge and restrict milk flow.

Milk Tank, Silo or Vat

Most in New Zealand aim to cool milk down to no more than 5° C (41° F) within three hours of milking. In Australia's hotter climate the figure is 4° C (39° F).

The refrigerated milk tank is a possible cause of lipolysis (fat damage). When un-cooled milk is "shock cooled" by entering a mass of cold milk from the previous milking, there is a possibility of fat globule damage. This is usually made worse if the milk pours from the delivery tube from a height, on to the surface of the already cooled milk, which generates a foam and causes a churning action.

Milk should be cooled and if possible the milk tank (vat) should be filled from the bottom, or if this is impractical, then the milk should be allowed to run down the side of the tank.

In New Zealand all tanks have to be elevated for ease of connecting and pumping into the tanker. Tankers frequently have trailers, so reversing is not allowed. There has to be a turning circle. Livestock are now not allowed on the tanker turning circle or road.

If these conditions are not met, the milk is not collected. I mention all these points because they will apply to all milk exporting countries in time. European Common Market inspectors check our dairies and take water samples for checking, to ensure it is potable for food production.

Oil Recirculating Muffler

These save oil by double filtering it and recirculating it through the vacuum pump. They have many advantages, especially under today's economy. Vacuum pumps run quieter and cooler, and last longer, and the dirty mess at the exhaust is eliminated.

The average vacuum pump runs for about a thousand hours a year, so needs thorough lubrication, especially at the end of milking when washing water and steam can remove the oil. After washing, vacuum pumps should be run under vacuum again for a few minutes, to allow oil, which may have been removed by the steam, to cover the inside of the pump. Switch on and off under vacuum. A non-return flap allows the latter without the plant running in reverse.

Seasonal Milk Production

Milk for manufacturing into butter, cheese, milk powder, casein, etc., is much better produced in spring and summer from animals grazing pastures giving CLA milk. Despite this,

many countries have daily quotas which encourage year round production. Some pay premiums for winter milk and end up with more milk being produced in winter than in summer, which is very inefficient, so some is made into butter an cheese causing milk payouts overall to decrease at the expense of the producer.

See Turn-Style Master 9709.

Parlor Types

The need to reduce the number of milkers, and also provide better individual cow attention, were the two main reasons behind the development of the Turn-Style by dairy farmer Merv Hicks in Taranaki in 1969. These advantages are even more important today, as herds become larger and staff more costly.

It can save one staff member and possibly a house for them which brings the cost of the Turn-Style down.

One person can milk 400 on their own with cluster removers which take all off just before exiting. If a cow has to go around twice, lift the lever-switch and put a chain behind the cow.

I'm not talking about auto cup removers which cost more and can be a pain. With seasonal milking they are not necessary, a standard remover will do.

A client does this on the basis that for one week he milks the 300 cows in the morning and his helper in the afternoon, then they change. It allows weekends off. They have bought the neighbouring farm and will be doing 600 cows like this next season, but in two herds.

With over 300 cows, rotaries pay. Milk production increases and dung in the yard and parlor decrease because they are out so quickly and in the paddocks for longer.

The benefit of having a Turn-Style on a one person farm, where labour isn’t saved, is the individual cow attention, and the more relaxed milkings and cow handling. Feeding grain (only one automatic feeder is necessary), drenching and treating animals are easy, because each cow is in an individual bail, which means that they don't upset adjacent cows. AI and herd testing are also easy.

The New Zealand herringbone was invented by dairy farmer Ron Sharp of Gordonton in the Waikato in the 50’s. By 1980, over 80% of dairy farms had them and about 15% had rotaries.

Differences in cost between the larger Turn-Styles and herringbones are not great. For instance, yards, buildings, and milking equipment costs are much the same. The main differences are in the platform and bails. A Turn-Style can save a staff unit, which could also save having to have a house to accommodate him/her.

NZ herringbone parlors are quite different from the older ones in the Northern Hemisphere where the operator also stands in a pit, but that is where the similarity finishes.

To reduce milking time, drafting gates can be connected to each other as pictured, where one lever opens one gate and closes another for drafting out cows to be held back for mating. See the Herringbone plan and SGF Milking Systems video for both these and many more milking ideas.

Ensure that the design allows any cow which might fall into the pit, to be able to walk up steps and out the front of the pit and be drafted back again - so she doesn’t think it is the way to always escape!

Ensure that there is plenty of lighting so that damaged, infected and sore teats can be seen.

Photo #

Drafting gates operated from the parlor make it easy to hold back cows for the vet or mating.

Dairy farmers spend a lot of time and energy in the milking parlor, so even small savings in time at each milking can add up to a considerable amount over a year. Also, stress can build up in cows and milkers if milking is hard work because of inefficiencies through bad design. If anything needs to be user friendly, the whole parlor does. Stress in the parlor can carry through to other staff and the family. There is no need for any stress at all. Milkings on some farms run so smoothly that milkers love it. To achieve this not only do the parlor and milking machine design have to be spot-on, but the health of the cows and milkers must be perfect.

Our daughter who milked 60 goats saved 1.5 hrs a day after changing from old vacuum driven pulsators (not DeLaval) to DeLaval eletronic ones. Goats came in faster, milked out more quickly and stopped kicking clusters off. She became a much happier milker.

The milking parlor is a food processing plant, so must be up to the standard for this.

Deciding which type and size of milking parlor to build is not easy, and each farm has its own particular requirements. Farmers have their personal preferences, but high on the list of requirements should be ease of use, low labor input, and a short milking time, because these points will have a long term effect on the farm's profitability.

It is uneconomic to have, or build, labor intensive systems to save capital outlay, and have a permanent higher wage bill, with the housing costs of extra staff.

With a Turn-Style type (the first invented external (operators on outside) rotary parlor, cows walk on and off the platform on their own without wasting milker’s time loading and unloading. It has to be seen to be believed. This means that only two milkers are required for up to 60 bails. If cluster removers (CRs) are used one person can milk on their own. If there are no CRs and one person is away, the other can apply 50, then remove 50. In a herringbone of similar size, four milkers would be required, and milking is slower than with a the Turn-Style.

CRs in a herringbone on a seasonal milking farm are pointless and can slow things. Where there are cows with mixed calving dates it is best to have two or more mobs to feed the fresher mob more and to have all the lower producers together to save over-milking them if CRs are not used.

Doubling clusters (sets both sides of the pit) was done by perhaps half a percent here in the 60s, but I don't know of any now. The work of hanging them up and extra washing are time consuming for no benefit. Have two clusters more than necessary which can be put on slow milking cows as soon as they enter.

Here many use 20 clusters per person and keep up (I think 16 is plenty), and our cows milk out faster than Northern Hemisphere ones because of less milk and faster let-down.

Don’t build a parlor on top of a steep or high hill. There is one thing harder than walking up hill, that is carrying 20 kg between the legs.

A large square farm should have the parlour in the centre and lanes going north, south, east and west to a circular lane which is half way between the centre and the boundary. A smaller square farm could have the parlour in one corner with a lane to a circular one. This lends itself to

pivot irrigation.

Milking Systems

The old saying "Necessity is the mother of invention" applies to dairying. To my knowledge there has not been a low cost, labor saving milking system invented in the northern hemisphere, because subsidies have ruined farmer initiative and necessity. Swing-over herringbones in several variations, pendulum and round yard backing gates, and efficient rotaries, have all been developed in New Zealand. The so old called milking parlors in the northern hemisphere are absolute disasters for milking more than a dozen cows. Developed by engineers and those aiming to sell as much pipework and junk as possible, they are slow, hard to keep clean, and the opposite to what cows and people need.

Lanes

The lane should be as straight as possible to the parlor to save time, and because cows don't like walking in a direction away from the parlor, when supposed to be going to it, so they slow down. Avoid having tight angles, because cows don't like walking around tight bends, and, when they do, they open up and twist their hooves, and damage the lane. The lane should widen by about 50% for about 20 metres before the parlor, because cows slow down at that point.

Milk production drops about a litre (2.2 lb) for every mile (old statistic) walked, and somatic cell counts increase with walking, so keep lanes to the parlor as direct as possible. Cows don't like walking up or down hills, so try and avoid them if politicians. We changed a right angle lane which went up and then down a small hill to cutting across at the foot of the hill on a 45 degree angle. It created two triangular paddocks which were a nuisance, but worth it.

Milking Time

This is from a good dairy farmer milking 800 cows in an external back-off rotary parlor. There are a number of ways we have speeded up milking. Most relate to milking equipment.

- Electronic Pulsation
- 2+2 pulsation rather than 4+0.
- Low milk lines.
- Pulsation ratio of 60-40, changing to 70-30 later in the lactation.
- Selection of cows for fast milking.
- Removing clusters automatically after six or seven minutes (longer in higher producing herds) irrespective of whether finished or not. This is only recommended in large herds where milking time is critical, but cows should be selected for fast milking in all herds.

Milking Times

Research in New Zealand with New Zealand cows on pasture producing less than US ones in confinement has shown that 12 hour intervals are not essential between milkings, and that milk production is not lowered by 16 and 8 hour intervals. Despite this, most farmers aim for even intervals, while Ruakura AgResearch staff milk at 7 am and 3 pm which are 16 and 8 hour intervals**.**

Yards

Part of a good milking system must include cow comfort in the yard while waiting to be

milked. Cows don't like heat, so will come to shade if provided. Plastic shade cloth over the yard gives shade and creates a draft. It costs little and encourages cows to the yard. A sprinkler used correctly also helps. A fine mist sprayer is essential in summer to cool the concrete well before the cows arrive and to control flies and midges. A very coarse sprinkler on for too long can give some cows pneumonia. Turn it off once they are cool. It can be turned on again if necessary.

Cows, instead of having to be pushed up the lane and into the yard on hot days, will move quickly once they learn that they can stand under the cool spray, free of flies. A coarse sprinkler on a hot day can give some cows pneumonia, so use only a fine spray, which also uses less water. On hot days cool the concrete by turning it on before going for the cows. Have you ever stood barefooted on hot concrete? Cows standing for up to two hours in the sun on concrete, even with a sprinkler, will not be in a frame of mind to release lots of milk.

Shelter is appreciated by both cows and milkers at the parlor. Horticultural shade cloth makes very useful shelter.

Adequate yard space so that cows have room to move with comfort, especially in large herds where low-ranking (pecking order) cows need space. Allow approximately 1.5 square metres/cow yard space and 5 to 9 per cow for wintering pad space.

Rectangular yards are best because the cows don't have to turn around and are not squeezed into corners and easily extended.

The entrance to round yards should not be in the centre, but should be to one side so that the cows don't have to turn once in the yard and just keep walking to the milking parlor entrance.

The pipework and reinforcing in the parlor and yard should all be welded together before laying the concrete.

Concrete surfaces should be smooth, but non-slip. Cows are frightened by slippery surfaces and this will affect their yard entry and parlor behaviour and the amount of effluent to be cleaned up. Cutting grooves through the concrete helps. There are contractors who specialise in this in New Zealand.

Having milking start the moment the first cows enter, speeds their entry, so if on your own use a good dog, and have the radio and machines running as cows near the parlor.

The rump rails should extend three metres (10') into the yard to discourage cows from changing sides and taper together. Leave a gap wide enough to walk through in case you do have to go to the yard to observe bulling cows, etc.

Solid yard walls encourage cows to look and move forward. Walls are essential just before the herringbone pit to discourage cows turning back. With rotaries they are impossible and unnecessary because cows close to the rotary push and even fight to get on. This has to be seen to be believed.

Where they back off rotaries and have to turn, the concrete should be covered with a large one-piece rubber mat.

There should be good race and head bail for veterinary use and artificial insemination.

Labour saving devices help, such as single lever drafting, and a portable hanging step to hook over the nib rail and step on, to check the top of tails to identify in season cows while being milked, and to see those bulling in the yard. Mirrors in appropriate places help with this.

Backing gates

The backing gate can be run on the rails and be winched. If a motorise wheel is used and slips, try a rubber band in the rim.

Gate wheels on concrete can have difficulty moving the gate in freezing conditions because the driving wheel can spin on the ice. Chains on the wheel may help.

We had a manual winch system on our round yard in the 1960s. An electric fence reel wound in the cable which was kept on the outside of the rails with 25 mm (1 inch) lengths of 6 mm (1/4 inch) rod welded on at a slight upward angle so the cable could slip off. The gate had an elbow going up and over to the outside of the rails so as it came round the wire moved away from the rails.

If cows learn to hold the gate back install a low power (through a flood gate controller) wire and a switch in the parlor to turn on only as required which may be only once a month. A timer should switch it off after a few seconds. If the earth (ground) system is well away from the yard and not behind the parlor current should not go through the parlor.

There are Kiwis in the Northern Hemisphere installing milking and yard systems, but they are kept busy and have employment restrictions in some countries. Check in the Stockman Grass Farmer.

Points to Watch

- The aim is to develop a simple, sustainable system of removing milk from the udder as quickly and comfortably as possible, so that the cow enjoys the experience of having her udder pressure relieved.
- Smooth cow flow into and out of the milking area.
- Shelter is appreciated by both cows and milkers at the parlor. Horticultural shade cloth makes very useful shelter.
- Concrete surfaces should be non-slip. Cows are frightened by slippery surfaces and this will affect their parlor behaviour and the amount of effluent to be cleaned up.
- There should be good separate facilities for veterinary use and artificial insemination.
- Areas for bulls should be secure and out of sight of cows if possible.
- Concrete should be of 50 year life-span quality with steel reinforcing to prevent cracking and to allow welding of it to building and rail supports to eliminate stray current flows.
- Electric fence earth systems should be 100% efficient, and placed in a damp area well away from the parlor, to avoid current flows through the parlor.
- There should be a safe lockable storage area for all drugs and needles, and a clean convenient area for the parlor records.
- The tanker track and turning area should meet the approval of the dairy company. A happy tanker driver is a good ally.
- Money spent on keeping the area around the parlor and milk room clean, tidy and landscaped is well invested. It can so easily affect the attitude of staff to their work and the stock. Happy staff mean contented cows.
- If cows coming back to the parlor to try and find their calves is a problem, instal a non-return gate the end of the exit race. This will encourage cows to keep moving until they are through it. These gates are 38 mm (1.5 inch) horizontal U shape swung leaning down so they close on their own. Cows put their heads through the two pipes and walk out. +

The entrance to the pit should have the rump rail extending up to 5 metres from the last cow into the yard to stop cows changing sides instead of coming in. If one side is preferred by many cows, especially older ones, check why, including for shocks. See VJ Fencing > Shocks.

Other Causes of Milk Dropping:

- Heat.
- Lack of good cool water.
- Low cobalt levels. Co should average 0.13 ppm. If low give vitamin B12 and correct Co levels.
- Low or high sodium levels.
- Mold or toxins (including endophyte) in feed and/or pasture.
- Short in length pasture, silage or hay not being fully digested. Silage should be several inches long and lacerated, not chopped short. Digestive problems our from short cut feed which can't be regurgitated.
- Insufficient saliva through low mineral levels, eating moist food and fast eating.
- Subclinical metabolic problems.
- Parasites - internal or external.
- Electric shocks in food troughs or water tanks. Shocks vary between dry and wet weather because grounding rods become less effective in dry conditions.

Milking Systems

To handle a large number of clusters and milk fast (100 cows per person per hour without effort in a herringbone or double that in an external rotary) one of these systems will be required.

When planning a new dairy remember the following -

- Cows don't like walking other than to graze and to find a better bite, so position the parlor centrally. This will save you a lot of milk and time fetching and closing cows in paddocks.
- Carrying 20 to 30 kg (44 to 66 lb) between your legs twice a day is not fun, especially up hill, so don't build on top of a steep high hill if it can be avoided.
- If the parlor is on a slight rise, drainage and effluent flow away is more easily.
- Position the parlor down wind of the milk room and any homes, especially those of neighbours and townies. Ones own smell is bad enough, but someone else's is not acceptable.
- If on an irrigation farm being able to have the effluent enter the irrigation water saves the extra cost of spreading it, however, be aware that it may increase algae. The smell of spreading effluent must not offend neighbours. Low pressure travelling systems cause less smelle than high pressure systems.
- The effluent from large herds can cause pollution problems in time, so don't spread it where it can pollute waterways, ponds, lakes, bores, wells, etc. See Fertilising, Effluent.

Herringbones

This system was invented in 1952 by dairy farmer the late Ron Sharp at Gordonton near Hamilton, but took more than 20 years to be widely accepted in New Zealand. When pouring concrete for the walls of the pit with the help of a friend, the boxing collapsed. "Never mind said Ron, we'll spread it out and it can be the floor."

As with anything there are rules which must not be broken and things which can be improved. They are -

- A herringbone with a straight rump rail and cows standing close to right angles to the pit speeds loading and emptying of cows, reduces the distance they and you have to walk, doesn't cramp large cows and holds small ones more firmly.
- If you are not quiet with your cows or have nervous cows and are concerned about

cows sliding back when drenching, either don't drench (thousands don't, especially now with good on-line drinking water mineral dispensers) or make the bottom rail a small zigzag one. Plans are available from the many builders in many countries.

- Straight rails with cows standing at 30 to 45 degrees don't work because the cows can slide backwards. They need to be between 60 and 70 degrees to the pit. After I changed from a zigzag to a straight rail in 1960, cows and I became more relaxed and milking speeded up. Incidentally, I was told that a straight rail would not work. Later we put another about 30 cm under the main one to protect the milker, make the cows feel more secure and reduce the chance of a cow falling into the pit.
- A second front (breach) rail under the main one makes cows lift their head. They then can't see the milker, so wild ones don't kick at them. Both should be on the same adjustment which swings in for recently calved cows and out for heavily in calf cows.
- With this system clusters are applied from the back between the back legs. This has been done for decades in most herringbones and all rotaries in New Zealand so, from selection, our cows have udders which are further back than those milked from the front and selected for this.
- To speed cows exiting, have a full width pendulum or guillotine gate. These gates are available from NZ manufacturers and can be closed from any position in the pit between cows as they walk out. Ordinary swinging gates are not satisfactory. They can't be closed against a strong cow trying to go through.
- Have drafting gates operated from the pit.
- Have a short wide exit race from there to the lane. Animals move more quickly along round races because they can't see the exit, so these can be used around round yards. Abbatoirs and dry stock farmers know this and build round races around round holding yards. Install a non-return gate at the end. This is C shaped or more like a horizontal U, and hinged to swing and close again against a stop so cows wanting their calves can't come back in. If the race is wide have two gates facing each other. Cows push their heads under or through it as they go out. They feel they are not out of the parlor until through the gate so keep moving, unless you have calf pens before the non-return gate, which you should not. Also give them a fresh paddock or break after every milking to encourage them to move away.
- Study time and motion in everything you do. In 1960 when milking 98 cows on my own I got out of bed at 6 am and was in for breakfast at 7.30 am. My dog fetched them and kept them coming in to the herringbone gently.
- Never leave the pit. They should want to come in and a backing gate or dog should help. If you start getting out and chasing them in, you will always have to.
- Cows on pasture should be clean and so should the lanes, so udder washing is seldom required. Mastitis decreases when udder washing is stopped - unless necessary. The more time between first touching a teat and applying the clusters the more mastitis. When I was staying with a grazing client in the State of Maine in 1990 I pointed out that his cows didn't like being washed and showed this by fidgeting and occasionally messing (solid or liquid), whereas they stood still while applying the clusters and during milking. He stopped washing, saved 20 minutes, and you won't believe this, but the milk was UP. The lesson from this is to watch your animals. They tell you things all day. Spend the time you save by filling gateways with sand, fixing lanes and keeping yards spotless. Many dairies in the Northern Hemisphere would be closed down in New Zealand. Our parlor and yards have to be washed spotlessly after every milking. Inspectors check

on them. Unfortunately we do have a few farmers who are slipshod sometimes.

- Have the pit and bail long enough to hold an extra cow or two which hold in the last one being milked so that you don't need a back gate or chain behind each row of cows, except for the very last cow milked when you use a triangle which you can slip over the rump rail from the pit.
- At the front of the pit have no gate or restriction so that if an animal falls into the pit it can walk up the steps and out.
- Cow entry into the herringbone should be straight, and if possible near to straight out. Having to turn slows movement.
- Open the exit gate from anywhere in the pit while there are still about three clusters on, timing it so that the last cow starts to move as you remove its cluster.
- Walk up with your hand on the back of the last cow's rump to keep it moving and to be ready to close the guillotine gate. The first cow will be there, put its cluster on and the others should be in place. However you must keep them well packed in all year. Don't slack on this. If they get casual and stand spread out - which they would like, then when first calvers arrive they will be able to move around instead of being held firmly by the others. If held correctly, first calvers can come in and be milked without even knowing it, although it is a good idea to let them come in a few times some time before calving with an old cow and find their own way out quietly without stopping them. If cows don't come in check for shocks, protruding injury points, slippery floors and other bad designs.
- Have remote controlled drafting gates to hold back AI breeding and sick cows.
- Cows are not cats, so don't like to enter dark parlors, so ensure that there is some clear plastic or lighting in the roof. Rotaries now have an open-centre or even no roof.

Install a self closing horizontal U gate cows push through to get out of the race and into the lane. Cows feel they are not out until through this gate so move out more quickly.

At the end of the exit race, where it widens into the farm lane, mount the gate. It should be made out of 1.5 inch ID pipe in a U shape.

..____
.I____

Hinge it close to the supporting post at the bottom and about two inches out at the top so that it swings closed without needing a spring and against a stop so that it can't be pushed inwards. Cows soon learn to push their heads through to exit. If not, prop it partly open for the first day or two. I made and fitted one in 1960 to stop cows coming back up the exit race to try and get to their calves, and found that cows exited more quickly.

Rotaries

The external rotary Turn-Style milking principle, first built in 1969 by dairy farmer Merv Hicks in Taranaki, has now become very popular with 2,700 in use world-wide. Many of the country's first Turn-Styles were built in Taranaki, but now they are being built throughout New Zealand and installed in many countries. The first ones had the wheels on the floor. This was changed to instal them upside down and run under the rotary platform out of the water and dirt.

Milking in a Turn-Style is much simpler, in fact it is hard to do anything wrong, although I've seen milkers walk past the back of the cow to get the clusters and then walk back to the cow

to apply them. They should start the first cow by picking up the cluster and applying it as the cow passes. Cows come in one at a time and leave one at a time, so they are handled as individuals, yet in one or two mobs. Cows face inwards on the carousel and back off when finished. The milk line is under the carousel, so the benefits of low milk line and low vacuum (36 kPa or 11") are achieved. The necessity of a high milk line with the associated higher vacuum is one of the disadvantages of herringbones.

Training staff takes just a few minutes, while training cows to enter takes two to five milkings. To encourage a cow to enter the bail, walk behind it holding about three metres or rope horizontally in both hands and against the cow, Swing the ends of the rope in a circle so that the cow can see both ends swinging, so walks forward.

When herds are changed from other milking systems to Turn-Styles, cows become much, much quieter (some almost go to sleep on the carousel), and have to have dripping water or a hanging plastic drum or bucket touch their nose to remind them to back off. Cows push to get on and become so relaxed that have to be woken up to get them off. When feeding grain it is even harder to get them off. If you have a problem, hang a wire or netting from a low powered electric fence just after the hanging drum does the trick. Power can be reduced with a Gallagher Floodgate Controller. If wishing to lower the shock even more, two can be used. Cows soon learn to back off before the wire. Some might express horror about having shocks in the parlour, but trials at Ruakura showed that cows getting one shock at every milking soon became accustomed to it and lost no production compared with the controls. The alternative is to hit the cow on the nose which is more stressful for it and adjacent cows.

Production per cow and per farm usually goes up after the change to an external rotary parlour. Milker attitudes also improve because stress not only drops, but almost disappears. 500 cows can go through one without even one messing.

A clients who has two people on the farm milk 350 cows on their own once calving and breeding are finished - one in the morning and the other in the afternoon.

Currently there are large dairy farms building herringbones when they should be building Turn-Styles. The extra cost is returned in saved labour, saved housing for the labour, and saved time by the fewer people milking, within a few years, and the wonderful asset remains. Eleven percent of parlors in NZ are now Turn-Styles.

The only two milking mistakes I've seen are hanging up the cluster on the wrong side of the empty bale so that the person applying had to pass the cow and return back to apply them, and pulling clusters off roughly instead of letting them drop off gradually. Automatic cluster removal, easy in a Turn-Style, overcomes this and saves a labour unit, allowing one milker to handle up to 300 cows per hour.

Udder washing, cluster washing between each cow, teat spraying, cow counting, cow drafting, bale washing, are all automated, so there is little room for human error. Meal feeding requires only one unit. Turn-Style sizes vary from 20 to 60 bales. A 50 bale unit is ideal for two milkers and up to 400 cows.

Internal rotaries have had a lot of problems in many countries over many decades and were designed for the wrong reasons including - seeing all cups and cup slip (it would be better to fix the milking machine). In practise the milkers are so busy that they hardly look around and when they do there is seldom a problem so why do so. Training cows to enter towards a pit and turn their back on it takes months.

External Turn-Style type rotaries are the only ones to consider (the milker stands on the outside), cows walk straight in or on a slight angle, and back out. The cream of staff and sharemilkers apply for external rotary jobs. The few who criticise them haven't milked in one. Training takes less than a week. Young people are more inclined to city type work, than to milking cows, so dairying has to be made more attractive with automation and improved technology. Because the cows enter and leave one by one, labour saving features are easily incorporated. These include -

- Teat spraying in the exit race where two nozzles each spray a 360° full cone circle, activated by an infra red beam. A raised ramp brings the nozzles closer to the udder and ensures that the cow's legs are spread at the time of spraying. Because cows leave the Turn-Style soon after cluster removal, spraying is in time, whereas from a herringbone they go out in a group, some eight minutes after cluster removal, which is a bit long.
- A digital cow counter can be mounted in the parlor, and read at any time.
- Automatic drafting can be done by placing a magnetic activator on the platform behind to the cow to be drafted. As the cow leaves the platform the auto drafter senses the magnet and opens the gate. A buzzer sounds to alert the milker to then remove the magnet, or manually override the controller if necessary.
- Automatic identification is easy because each cow puts its head into a fixed bail.
- Automatic gate openers and farm dogs allow the fetching of the next mob while milking continues, provided the lane system is planned for this.

Mobile & Portable Milkers

Even a simple herringbone, with yards and concrete lanes around are an expensive complex which small dairy farms have difficulty justifying. A mobile or portable milking system may be the solution. Cows are milked in the paddocks. They are used with small herds in some countries. The mobile one has bails on wheels and is moved with the cows. The portable has no bails - just the engine or tractor power-take-off, vacuum pump, clusters, buckets and cans. Major savings are with both -

- Lower cost.
- No electric power is required. An engine drives the vacuum pump.
- No concrete (cement) required.
- No mud. They are moved after each milking.
- Clean and fresh, but in bad weather things can be difficult.
- No loss of milk from walking.
- Time is saved because it is quicker to take the milking equipment to the cows than the cows to the parlor - and back to the paddock. Milkers have only two trips instead of four. There is no yard washing.
- Their is no effluent disposal.
- Their is no waste of animal manure in lanes and yards.
- Because the system is run by an engine or power take off of the tractor, milking is not subject to power failures.

Points Against Portables

- Milking large herds would not be practical.
- Cows for the vet and artificial breeder would have to be taken to suitable facilities.

- Herd testing would be difficult.
- Messy in wet weather.
- The milk has to be taken to a suitable point for the tanker to collect it.
- Ample milk cooling water has to be available and disposed of.
- Some dairy companies may not approve of them.

Once the parlor type and size has been decided, the type and brand of milking machine has to be decided on. All I am writing about on brands is that dozens have come and gone leaving users without spares, so choose a large well known well established one.

First Milking Machines

As far back as 380 B.C., attempts were made to mechanically harvest milk from cows. The first known devices were used by the Egyptians and were simply wheat straws inserted into the cow's teat. In 1850 the "New England Farmer" referred to the use of hollow leg bones of robins for the same purpose.

These crude devices led to damage of the sphincter muscle at the end of the teat, and quickly fell into disfavour. When this muscle becomes damaged, it can't close to protect the udder from infection, so bacteria can invade the udder. This can give rise to mastitis and production losses.

From the 1800's many machines were invented to physically squeeze the milk out of the teat but were complex and difficult to keep clean, and quickly became obsolete. One thing became obvious - that the complete co-operation of the cow was essential.

Early milking machines were notorious for the production of butter! This churning of milk is still encountered in the form of foam or froth. When fat globules are subjected to the surface tension forces which occur at air/milk interfaces, the protective fat-globule membrane is broken, so the actual fat is exposed to the milk. Even during storage at low temperatures there is then a release of free fatty acids, which produce a rancid flavour in milk. See Froth and Quality below.

Modern Milking Machines

A good milking machine is even better than a calf. I remember in South Africa in about 1950 when we installed one of the first milking machines in the area, many cows, especially those recently calved, turned their heads with a pleasant expression and some mooed as if looking for their calf, showing that the milking machine was more natural and kind to them than hand milking.

The latest milking machines are electronically operated, but can still be simple without too many flashing lights and gimmicks, and still need servicing and replacing. Milking machines earn money, but in most cases are replaced only about a quarter as often as tractors, which gobble up money.

This may be because the operation of milking machines is less understood than that of tractors. The following may help with their purchase, operation and servicing.

Before purchasing a milking machine, the decision should be made regarding all aspects, for example, which pulsation ratio of 70:30, 60:40, 50:50, etc. Most farmers choose 60:40. Cows hate change, so once the pulsation rate has been chosen, it should not be altered, but the vacuum level can be adjusted up or down, depending on the speed of milking, but it should not be changed by more than about 4% at any one level. Generally the higher the vacuum level the faster

the milking, but the higher the chances of teat damage, although if the vacuum is too low, teat damage can occur because the clusters are on for too long and liner movement can be inadequate.

Vacuum levels at the milk line should be as low as possible and set according to the height the milk line is above the where the cow stands (feet level). Low lines (below the cow's feet as in most rotaries) should be about 42 kPa (12.6 inches). High lines, 1.4 metres above the cows' feet should be about 44 kPa (13.2 inches). If 1.6 m, 46 kPa (13.8 inches) and if 1.8 m, 48 kPa (14.4 inches). Milk lines should never be more than 1.8 m above where the cow stands. For every 500 metres (1,600 feet) above sea level the vacuum should be about 1.5 kPa or half an inch lower.

Purple or blue teats indicate high vacuum and/or clusters on for too long or that the liners are wrong. Don't accept any, take corrective action.

Correct vacuum is important, so some farmers have two gauges. Position them so that they can be seen when milking to ensure fluctuations are kept to a minimum. Watch them while applying clusters to avoid excessive drops. Get them checked at least annually.

On one farm the staff speeded up the machines on weekends, for their obvious reasons, until the non-resident owner noticed on the daily milk dockets that the milk was always down on weekends!

Installation

The fall in the milk line should be in the same direction as the floor to avoid having a large variation between one end and the other, because vacuum levels at the teats will vary. Where the receiver is above the pit the fall will be from both ends to it, so differences will be less.

Once installed, even new milking machines need checking completely before use. A problem I was called to occurred because the pulsators were mixed by mistake, having different ratios. The cows objected and the milker was mystified until the mistake was discovered by testing the whole machine.

Pulsators should have large automobile type air cleaners, but few do, and even if installed are seldom cleaned. Clogged filters mean that air can't enter the pulsation system quickly, so the changes from milking to resting modes and back are slowed, as is milking. Dust reduces pulsator life, shortens servicing periods, and increases servicing costs.

Milk Tanks

Milk is in contact with the tank for longer than with any other surface so its condition can affect milk more than any other item. It is also the hardest to wash because it has a large surface to wash, doesn't benefit from the speed (friction) of fast water movement and is the most difficult to warm so cools the washing water fairly quickly.

Your dairy company should have given you a chart to stick on the tank to show washing routine including how much wash water is needed for your size tank. Generally a 2,000 litre one needs 5% (100 litres) for a single pass wash and 4% for a recirculating wash and 10,000 litre tanks need 2% and 1.5%. These figures are after thorough cold water rinsing and pre-warming with up to 2% the tank volume of hot water. A recirculating wash should last for 5 to 8 minutes before the temperature drops to 50° C,

Check spray nozzles for blockages, and to ensure that they are giving a complete coverage inside the vat and the flow exceeds 130 litre/minute. If not, hand scrub the areas which are missing out and adjust the nozzles. The detergent rate should not be reduced, even if you have soft water, because the sanitising effect and pH will be weakened.

Important

Mechanical aspects of the milking machinery must be kept in top condition!

Problems with leaks, vacuum, dead ends, insufficient heating, will cause inefficient cleaning through:

1) Loss of cleaning solution
2) Loss of velocity
3) Loss of strength of the solution

Safety

Modern washing chemicals are powerful and should be handled correctly.

1. Store out of reach of children. Children seldom open a container and drink some of the contents, they more often drink a detergent from a small container such as the measuring jug of mug. Keep these high and don't measure out the detergent or any other product until ready to pour it into the water. Then drop the measuring item into the water so that it gets washed each time and is not left lying around. Make this a rule on your farm even if you dont have children - they can come with visitors.
2. Store away from other chemicals.
3. Keep the containers sealed.
4 Keep the labels in good condition.
5. Handle with care.
6. Add detergents to water, not water to detergents.
7. Avoid splashes entering eyes.
8. Ensure no acid mixes with any chlorine product, because the emanating gas is lethal.
9. Dispose of empty containers safely.
10. For safety sake know where to find the United Nations numbering system (UN numbers).

The National Poisons Centre and Hospitals have these numbers, so that in an emergency they can quickly treat against the appropriate one. It is for the farmer's safety and ease of finding that the UN numbers are prominently on containers.

Calf Milk & Colostrum

Colostrum is a valuable calf feed (and human food) and should not be discarded. It is yellow mainly because of high carotene levels and milk fat is about half normal, so it is a good calf feed. Newly calved cows's milk must not be allowed in the milk tank for at least eight milkings. They can be run as a separate mob, or milked into a test bucket, or the milk can be diverted by using the wash line or a separate colostrum line. To use the wash line remove the jetter and connect the cluster. It can be used as a mastitis line when calf milk is not being saved. The same applies to a separate line. Don't allow mastitis or antibiotics milk in with the calf milk.

Always wash the cluster and milk tube thoroughly after using it for other than good milk.

See Calf Rearing for the preservation and use of colostrum.

Closing Down

With seasonal milk the milking machine should be closed down and serviced over winter.

After the last cow leaves the parlor, and dry cows have been checked for mastitis after drying off, wash everything thoroughly and get it serviced by a qualified person. Don't leave servicing until startup, as most others will, and there could be delays with getting it done and obtaining parts, and some cows always calve ahead of time. Read the instruction manual before the serviceman arrives, so that you know what he has to do, because, if he doesn't do a good job, you'll suffer, not him.

If you think servicing is unnecessary, look at these profit increases from surveys on servicing and/or updating milking machines. Plants serviced annually produced 1% more milk than those serviced less than annually. A survey ten years ago showed that new milking machines replacing twenty year old ones produced 8% more, replacing ten year old ones 6% more, and replacing five year old ones 1% more. Some brands of milking machines have improved even more in the last few years.

Check the instructions and/or with your supplier, to see if your pulsators can be cleaned by sucking alkaline washing water through them.

Before switching off the milking machine for the last time, run it under vacuum for a few minutes to spread oil over the inside of the vacuum pump. A non-return exhaust valve will stop it running in reverse and sucking moist air into the system. If there is not one (they are cheap), hold something over the exhaust pipe after switching off, then plug it and the suction end of the vacuum pump to prevent moisture entering over winter. About every two weeks over winter turn the vacuum pump a little by hand, or if you can't, run it for a minute or two under vacuum (it may mean half closing the inlet with a plug on an angle, rather than setting up the whole plant), and switch off under vacuum as described above.

Dismantle milk and vacuum lines, and the milk tank, and check for dirty corners as you go. Also clean all the vacuum pipes (a split liner could have left milk there), and all other parts normally not cleaned during the milking season. Check all seals and rubberware and purchase replacements ready for the start of the next milking season.

If existing liners are to be used until the first calvers have settled, remove and wash them then soak them and all rubberware in a strong alkaline or caustic solution (not an acid one) for a few days, then scrub and rinse them well and store them out of the light. Soak dirty stainless steel in strong acid. Use protective clothing, and add product to the water, not water to the product.

Birds can mess up milking machines, so install any bird scaring systems possible - it is not fun having to clean up before being able to milk again. Methods of keeping birds out include a cat, thin nylon fishing line tied **tightly** above perching points, hanging plastic sheeting or similar over openings, a time switch operated radio and/or tape coming on loudly every now and then. Tapes can include hawk, gun and other scare noises. They must not be left on permanently because birds become accustomed to them. Scare tactics must be varied and changed regularly.

If necessary, lay rodent poisons in small horizontal tins which keep it fresh and prevent cats, birds, etc., getting at it.

Check the V belts.

Leave all other taps and plugs open because air keeps things fresh. Hang something over openings to prevent birds, etc., entering. Cover critical milking machine parts (pulsators, control boxes, etc.) and the milk tank to reduce dust and bird problems.

Check the hot water heater temperature. Whether you switch the water heater off or not

depends on how well insulated it is, whether you may need some hot water during winter, and the type of element. Some water heater elements break down after being hot all their life and then allowed to go completely cold.

Check the detergent storage area and ensure that it is free of other than dairy products, and safe for children.

During winter purchase new rubberware and other requirements, and fit these a few weeks before calving. Change all rubberware at the same time, or some could be forgotten and infect milk later. Liners need to be changed every six months or to a maximum of milkings as set out by the milking machine supplier or milk factory.

Another winter job is to write with a bold pen, adjacent to the operation, complete instructions for setting up, starting, washing, and switching off the machines. These will be helpful for relief milkers in case you are unwell.

After assembling in spring, give everything a thorough wash and sanitise. Washing materials remove dirt, sanitisers kill the bacteria remaining.

The above jobs won't take too long, but could save time and money in the future and avoid quality penalties. Remember you are producing a food.

Servicing

Stressful milkings can cause cows to have cysts on their ovaries which lowers conception rates, and can also cause milkers to be depressed, get ulcers and be unproductive.

If you or some of your cows don't like milking, or if mastitis increases through the lactation, suspect your methods or machines, although shocks from stray electricity can cause the same symptoms. If the problems have been there for years, you may not even realise that you have them. Most milking machines and systems are faulty in one way or another, e.g., slow milking, not milking out completely, or causing some discomfort to cows and/or the operator. Upset cows or people don't milk well, so there are many farmers losing money through faulty systems causing -

- Ten percent or more of cows putting on excess condition. Also suspect shocks and bad milking habits.
- Slow milking which doesn't get all the milk, because the let-down hormone lasts only four to six minutes, so apply the clusters as soon as possible to avoid let-down time being wasted without milk extraction. Good milking machines should be able to extract the milk as fast as it is let down.
- Poor udder health, because of mixed shells (cups), including some with mismatched liners, which can be a disaster for udders.
- Poor quality milk which reduces dairy company earnings and payouts.
- Fat damage which can lower the milkfat test and give a taint downgrade to the end product.
- Increased power bills by taking longer to milk, creating more cow manure and washing, wasted staff time, and cows off pasture for longer periods, which is unproductive and more inclined to accentuate acidosis in winter and bloat in spring.

You should value your time like trades people and professionals do, and at about the same rates. Calculate the wasted time when milking, and budget to spend money on speeding things up. A New Zealand farmer who changed from a herringbone to a Turn-Style rotary, with a new

milking machine, halved milking time from two hours to one, and increased production by over a litre of milk a day in the flush. He attributed much of the increase to the cows spending an hour longer in the paddock twice a day.

The extra production amounted to $18 per cow (all figures are US dollars), or $3,600 per annum from his 200 cow herd. The saving in paid labor each year amounted to 600 hours, @ $10/hr or $6,000, giving a total saving of $9,600 per annum.

A mail survey I did of 600 New Zealand dairy farms showed that extra production from milking machines under five years old compared with older machines on the average size farm, was high enough to pay for upgrading to the latest plant, and that annual servicing paid for itself in extra production, so should not be looked at as a cost, but as an investment. Machines serviced annually produced 1% more than those not serviced, those under five years old produced 1% more per cow than those five to ten years old. Ten to twenty year old ones produced 6% less, and those over twenty years old produced 8% less per cow than those under five years old. From these figures you can calculate the possible return from upgrading yours.

On most farms the machine runs for about 1,000 hours a year. This is more than the average car or dairy farm tractor does, but these are usually serviced several times a year. It should be the first thing to look at if there are any problems, such as mastitis, poor milk grades, or abnormal cow behaviour at milking times, or if you don't like milking.

There are farmers with old mechanical type pulsators who don't think it is necessary to have them tested. However one complained to me about how long it took him to milk, so I checked his pulsators by putting my thumb in the liners during milking, and was horrified to find that they were set at about 30:70 (30 milking phase and 70 rest phase). He put his thumb in and said, "No, the squeeze was about 70% and the release 30%", but he didn't appreciate that the squeeze (air allowed in behind the liner) is the rest time when milk is allowed to enter the teat again, and when there is no squeeze felt (open so sucking when the vacuum is also behind the liner) is when the milk is being sucked out by vacuum.

A vacuum level of 51 kPa (15.5") in a high line led to an increase in mastitis. Pulsation rates of 75 pulses per minute have shown a relationship to increased mastitis infection, while a pulsation rate of 40 has been shown to cause discomfort to the cow.

Teat damage is known to occur in the event of machine faults, such as vacuum fluctuation and faulty liners. Incorrect liners are one of the major causes of cup slip, and increased mastitis is associated with liner slip.

Milkers have reported increases in milk production of up to a pound per cow per day following service, so, however busy or broke you are, get your plant checked over at least annually by a fully qualified person with equipment able to measure reserve vacuum, etc.

Pulsator ratios and speeds should all be the same, and, as well as the above, ensure that -

- All air lines slope towards drain points to avoid having water remain in pipes.
- Delivery lines leading away from milk pumps fall back towards the pump, to ensure that the pipes will be full when washed.
- The milk pipe is as low as practicable at the start, so as not to have it too high at the end of the pit. This can be difficult, as it depends whether the cluster is to be put on the cow; through the back legs, or on the side of the cow, and whether the rump rail is straight, or zig zag. A kick rail should be below the rump rail. It is very important that the milker is included in the decision as to the placing of the first milk line inlet, but there are several guidelines to consider.
- With a straight rail cows should stand close to right angles and clusters are applied

between the back legs. Put in two or three cows to establish the first inlet position. This ensures that the droppers will allow the cluster to sit in a natural position, without twisting and causing cup slip. I developed the almost right angle park herringbone with a straight back rail in 1959 and designed one for Massey University and others soon after. All liked them. There are thousands now. Cows must be positioned so that the claw comes in in the centre between the legs, then they almost never kick them off. Adjust the front rail to achieve this. If clusters are being kicked off they may either be touching the legs or the machine has a problem. If the hoses are too long (sagging) they will cause uneven vacuum levels and teat blasting with the milk in the sag, when subsequent clusters are applied. This will encourage kicking. When applying clusters ensure that almost no air is sucked in. First calvers and new ones to the parlor should be watched and the clusters held the cows have settled to avoid developing the bad habit of kicking clusters off. If bad habits are not allowed to develop they don't have to be broken.

- With a herringbone zigzag rail, cows can stand at less of an angle. The first space must be big enough for the biggest cows to stand comfortably. Full details are available on New Zealand MAF plans.
- Before constructing or even changing your parlor, see others, look at plenty of plans, get qualified people to help, and read all the books on the subject including 111 Ideas to Improve Milking by Jan Fox, Box 12-420, Hamilton, New Zealand.
- If doing any welding on a rotary parlour, have the earth clamp as close as possible to the welding to avoid current flowing through a bearing. It can cause burns on the bearings.

Backup Power

During power failures it is pretty frustrating waiting around to milk, but, with a tractor driven generator. milking can continue, and avoid upsetting the whole day's work. It can also be used to keep the water pumping for the cows, and to weld in the field.

Automatic Milking

Dairying could change with the developments in automatic milking for cows on pasture. A single box with robot can milk about 180 times per day. If the cows do an average of 2 visits that will be 90 cows per day. There is no reason why several boxes can't be used to allow larger herds to be milked automatically. This is being done in Ireland and one in Australia on a new grazing farm laid out for the purpose. One is now operating at Ruakura Animal Research Centre near Hamilton.

Robotic milking systems were first introduced in about 1992 in Netherlands by Lely Astronaut. Complete robot automatic milking (mechanical cluster application) is increasing in Europe, especially where it allows farmers with insufficient cows to make a living to go out to work. When they get back they can check every aspect of the milkings right down to which quarters of which cow have mastitis or blood in the milk. Very cleverly, the mastitis milk is diverted. The farmer changes the milk filters.

Cows go to the box on their own, but if they go more than four times, they are not milked. Teats are water cleaned and then air dried or just brushed. Teats are sprayed after milking.

See:

http://www.lelyusa.com/lelyarms_frame.shtml

Fullwood Merlin (They have licence of Lely Astronaut)

http://www.fullwood.com/merlin.htm

Prolion Freedom and AMS Liberty
DeLaval VMS (Voluntary Milking System)
http://www.alfalavalagri.com/MilkProdSyst/MPSen1.htm

Westfalia has also developed a robotic milking system.

The above are box systems. In Holland there were about 100 farms in 1999 using robots. Surge is developing a robot to use in parlors for large farms on the American market, and a robot is being developed for the Japanese market where cows are mainly tied up in stalls.

Developments in automatic milking for cows on pasture are underway. A single box with robot can milk about 180 times per day. If the cows do an average of 3 visits that will be 60 cows per day. There is no reason why several boxes can't be used to allow larger herds to be milked automatically. This is being done in Ireland and one in Australia on a new grazing farm laid out for the purpose.

Farm layouts would have to be a bit different from present, to allow cows to come and go from the paddocks. Two lanes might be necessary, or new small parlors might have to be built in the centre of farms, to allow cows to come in one way and go out the other, so that cows do not have to pass each other in the opposite directions which is not normal and could encourage some cows to change direction.

A reward to encourage them to come to the parlor could be the knowledge that they will then go to a fresh paddock. In early lactation they would be glad to come in and have their milk removed, and would learn that they would go to a fresh paddock after each milking. A small amount of grain, flavoured mineral mixture could also be used to encourage cows to the milking parlor or the only drinking water could be just before and just after the milking box. Non-return gates could ensure that after drinking cows have to go through the box, but only be milked if due for it. For the above system to operate, it would be necessary to have spring loaded one way push gates and the whole operation computerised, so that, after all the cows have been milked, the gates change to allow the first cows to re-enter, be milked, and go to another fresh paddock. Three or more times a day milking which would increase production would be advantageous and give increased production.

Automatic monitoring of the milk quality (mastitis, etc.) and the cows' electronic identification would warn the farmer by cell phone of problems in a more efficient way than is done at present. This technology is already available, but is costly per cluster. With automatic milking the number of clusters would be much fewer, so cost would not be such a problem.

Some milk recording systems already identify cows which vary from the norm and alerts milkers, so that they can take corrective action. Some can monitor heats, track semen inventory and breeding success, and compile health records, as well as perform the normal computer functions of "search and sort" in any group, e.g., production, age, health, calving, etc.

Milk analysing for a variety of cow idiosyncrasies is under way. This ease and speed farm management. Soon a cow in season (ready to mate) may be able to be indentified and drafted out.

Large herds could justify automatic milking to -

1. Save building a massive rotary milking parlour with a large concrete yard for $400,000 or more. The building cost savings would not apply where farmers have to have large buildings to house their cows in snow covered situations, and have to have plenty of staff for the work involved in feeding their animals through their long cold winters and for harvesting in summer.

2. Save staff - many New Zealand farms employ an extra staff unit just to help with the

milking. This may require a house. There is frequently insufficient work to keep both occupied between milkings, especially when contractors are used for making silage, hay, etc.

3. The current NZ fast milking (300 cows per hour) requires a tremendous volume of water and large coolers (heat exchangers) to cool the milk. Continuous milking with a smaller plant over a longer period wouldn't require such large volumes as over the present short period.

4. Fully automatic continuous milking would also allow for the on farm concentration (reverse osmosis or ultrafiltration) of milk which contains 87% water, especially where farms are a distance from the milk factory. Under New Zealand conditions concentration is at present cost prohibitive, because of the large unit required to handle the milk from 300 cows/hour (600 gallons/hour) without extra storage. Being able to do this would halve dairy company transport costs and reduce milk handling and evaporating costs. Waste disposal and water pollution problems at factories would also be reduced and the product left on the farm would be put to use as a stock supplement. It could be flavoured and used as an added incentive in encouraging the cows to come to the box.

5. Milk production increases with more frequent milking and when cows are not out of the paddock for up to four hours each day.

6. A limiting factor in increasing the size of grazing farms is the distance cows have to walk to be milked at the large central parlour. Smaller robotic systems can be installed at optimum distances.

Cows can be encouraged to the boxes with grain feeding, a small amount of mineralised concentrates in the small automatic milking parlour and/or by having the only drinking water there and the only exit from it through the robotic milkerπ.

As in everything in life, if we don't improve, we go back, relative to those who do improve, so keep thinking, planning and asking suppliers to provide you with your requirements - good ideas come more from users than from laboratories.

Aims of Milking

These are simple - to get the maximum amount of clean wholesome milk as quickly and easily as possible, with the least animal stress and human effort.

Cows make some milk between milkings, but make most during milking, which is done by a hormone causing the let down of milk. This let down lasts from four to six minutes, depending on the conditions, the cow and the stage of lactation. In New Zealand cows the let down is shorter than in USA ones, because typical New Zealand farmers have always had to milk quickly to get out and develop the farm, make hay, etc., without much help. A fast let-down, quick milking national herd has developed - don't change yours by delaying applying the clusters.

Let-down can start as soon as a cow enters the milking area, so clusters should be applied as soon as possible after the cows enter the bails. In herringbones, don't allow the second side in until ready to apply the clusters. If the milk is not removed within the period of let-down, some is lost.

Before Calving

Cows should be well fed on bulky feeds to start increasing the rumen capacity, so that after calving they can eat plenty to produce to the maximum and not suffer ketosis and lose too much weight. High producing feeds should not be fed until after calving. See Feeding.

If mastitis is a problem at calving, change the calving paddock to a new and clean one, and avoid allowing them to bag up and drip by feeding less pasture and more hay. After calving decrease the hay gradually to avoid sudden diet changes. If milk starts dripping from teats before calving, ensure that the cow is kept in a clean paddock or area, to reduce the chances of infection through the open teat. If dripping is excessive, milking may be necessary, but remove only enough to ease the pressure. Check that the calf has not died in the womb. Cows which develop very tight udders before calving may also benefit from being milked lightly. If you have to milk pre-calving, be more observant than ever for milk fever and have colostrum available for the calf.

Feed extra magnesium before calving, but don't feed extra calcium until after calving. See Feeding and Milk Fever.

First calvers should have been moved through the milking parlor a few times with experienced cows without stopping them, then with a short stop. Parlor training should always be done when on their way to a fresh paddock so that they associate the parlor with getting fed.

All cows, but especially first calvers, must be handled very gently. They will remember a bad experience.

Preparation

Until the 1980's most cows' udders were washed, and in countries where payouts were high, teats were quite often then wiped dry. The reason given for wiping teats dry is to reduce mastitis, whereas it should be to stop dirty water from the udder being sucked into the milk. Applying shells (new international word for cups) to clean unwashed, so dry, teats, has increased rapidly in recent years, especially after it was found that the milk produced was of better quality, and that both cows and milkers preferred it. If you watch cows, you'll notice that many fidget uncomfortably while being washed manually. Volume washing with a washing down hose keeps the cows cleaner overall and is more acceptable, but can leave dirty water running down the udder into the liners.

Whatever system is used, dirty teats and lower udders certainly must be washed thoroughly.

Hair around teats should be cut or singed to keep teats clean and hygienic to reduce mastitis spread and teat fouling and produce cleaner milk. If singeing use the yellow part of the flame which is not as hot as the blue part.

Also trim the long hair on tails to stop them getting dirty and spreading dirt to the udder and prevent the tail from becoming a heavy lethal weapon against milkers, especially in freezing winters.

If teats are washed, then aim to keep the time between washing and having the clusters applied as short and as near as possible to the same at every milking. Clusters must be applied along the same route, not from the last washed to the first.

If volume washing, do so from the receiver and wash no more than four cows, then apply the clusters in the same order as they were washed, then do the next four. With hand washing, fewer should be washed, with the aim of almost immediate cluster application. With two milkers, ensure that the one washing doesn't get too far ahead of the one applying clusters.

There will always be some variations caused by slow cows on one side, but try and keep these to a minimum by having extra clusters, and/or crossing over from slow to fast and from fast to slow milkers. Don't prepare ones opposite slow ones until ready to apply the clusters.

If you have a large bore (100 mm) line and milk alone, to save time, where ever the receiver is, start from the front of the herringbone and work towards the back, opening the gate so that as

the clusters are removed from the last cow it steps forward. Then walk along the pit checking the udders of those being milked as you go. Close the gate and start with the first cow. If you are drenching, all this changes.

Drenching is a pain, so try and use an in-line dispenser, dusting pastures, and balanced fertilising to reduce the need to drench. Don't dismiss this statement. Most of my clients produce about 10% more than their neighbours, mainly thanks to correct fertilising.

If you don't feel for cows having to wait after entering the bail, or worse still having to wait after being prepared, try going to the toilet when bursting, and wait for five minutes. Good luck. High producing cows have had to be culled because of damaged udders, after being prepared and left waiting for long periods. This is not a problem with rotaries because they enter and have the clusters applied seconds later.

Stimulation

Nerves in the teat ends send impulses to a section of the cow's brain. This in turn triggers a hormone called oxytocin to be released from the pituitary gland into the blood stream, and after about 20 seconds the hormone reaches the udder. The branch like muscles around the alveoli in the udder contract, and the milk is squeezed out of the cells and into the cisternal area. The emission of oxytocin starts when some cows enter the bail and lasts up to between four to six minutes, so milk extraction should be completed within this time.

In the natural state, seeing the calf, its nuzzling and bunting of the udder, along with suckling sounds provided stimulation for let-down. With mechanical milking it is provided by washing the teats, the milking machine being applied or, to a lesser extent, by the familiar sounds and routines of milking.

If any, and especially the application of, or the milking machine itself, are upsetting, let-down is not encouraged or is limited. If treatment is rough, or the cow is disturbed, adrenalin is emitted into the bloodstream, and other small muscles at the base of the alveoli close up and restrict the milk from the cell. The result is lower production and sometimes cows getting fat.

USA research has shown that gentle music from radios in the parlor help quieten cows, but not if it is so loud that everyone has to shout above it.

Cluster Application

If you touch each cow somewhere like high on the back of the leg before applying the cluster you are less likely to be kicked. Some cows don't need this pre-warning, some do.

Many milkers hold the clusters too low while applying them, so allow air surges into the system. This causes teat blasting when milk surges back at 30 kph onto the teat end in shells already on, or even into the teat. It damages fat, and causes vacuum fluctuations, the cows' biggest hate.

Apply the shells gently so that they don't go sshhh, clop, onto the teats, which is uncomfortable for the cows. A tight udder is like a tight four headed carbuncle, so should be handled gently. This applies even more so with mastitis infections.

When applying, hold the cluster hand high and avoid air intake by bending the short tubes rather than just lifting the shells up to the teats.

Air gushing in causes surges of milk down the milk line and into the receiver, which creates froth and also damages fat globules, sometimes lowering the fat test, and if excessive, causing rancid milk from the damaged fat globules. These are like fruit, so rot once the shin is damaged.

Correct vacuum is important, so some farmers have two gauges. Position them so that they can be watched when milking, to ensure fluctuations are kept to a minimum. Watch them while applying clusters to avoid excessive drops. Get them checked at least annually.

Cluster Removal

When removing clusters, close the vacuum first and wait for the clusters to drop into your hand. **Don't pull them off**. This common milking fault stretches and damages teats which are then more likely to get mastitis and black pox. Cows hate it - watch and see.

Try to avoid machine stripping (pulling the clusters down to get the last bit of milk) although some cows may appear to need it. Usually the milk not taken out is not lost, you get it at the next milking. Machine stripping can cause cup slip, which then causes milk to flow back and blast the end of the teat, which is not good for teat health or for the cow's comfort, so they fidget or kick. Keep a record of the ones that you have to machine strip, and see if they have more mastitis than the others. If so, reduce machine stripping.

Clusters left on for too long cause teat ringing and make teats go harder, and reduce their ability to fight against infection. Most of this happens at the end of milking after milk flow has stopped, so avoid leaving clusters on for longer than necessary.

The turn of a knob speeds the revolution time of Turn-Styles to reduce clusters-on time. In herringbones the number of clusters used should be reduced. Using the last cow or two to hold the others in, but not milking them, achieves this and saves the time taken in using a backing chain or backing bar. At the beginning of the season when udders are tight it is better to retain milked cows in the front of the row, rather than have cows letting their milk down long before being milked.

Teat spray with a good product immediately after cluster removal, before the teat end closes. Do so upwards, ensuring that a drop of spray ends up covering the teat opening.

As well as good milking procedures, there is quality. It is a good idea to give staff quality bonuses, for example an extra payment for no grades, low SCC and little mastitis all season.

Milking

Those who tend cows best make most money. Our best ever sharemilker, (Harry Blomfield) loved and tended all of our 120 cows (he was on 30% shares so we owned the cows) like they were his children and achieved the top production per cow and our lowest animal health bills. Although slower and more gentle with cows, he milked in less time than the next sharemilker who was tough on the cows, because the cows came to him, and came into the parlor without him having to get out of the pit to bring them in, and he required no back gate or chain to hold the last ones in.

Points to remember -

- Cows should want to be milked - they should not have any fear of the parlor or staff. If you milk in blue overalls then change to, say, white ones, when doing vet or any stressful work on cows and then don't use your voice. Ensure that the vet uses different colour overalls. Cows MAY not be able to differentiate colours as well as we can, but change the colour of your clothes after using one colour for a period and see.
- Always be consistent - avoid unusual happenings in the parlor area if possible. This is especially important after mid lactation, as the aim then is to maintain production. A simple example was a relief milker who had all sorts of problems with the cows until he realised that he

was wearing his own yellow apron, and not the owner's dark green one. He changed aprons and peace returned

- The time of day when you milk is not important - as long as you are reasonably consistent. Cows are adaptable, but try to be as regular as possible.
- Milkings should not be longer than 16 hours apart.
- If you have to treat animals and cause pain or stress, then do it away from the milking area if possible. If this is not possible, put the animals through the parlor for milking, then put them through again for treatment. Try to break the association between the two jobs.
- Train animals for daily drenching late in the previous lactation or over the winter, so they become accustomed to the routine before it is needed.
- Cows that don't fit into the routine should be culled. They can cost you lost production from other cows.

To train the cows to let their milk down quickly, apply the clusters as soon as possible after they enter the parlor, and after you have done whatever you have to do in the way of teat preparation. I suggest that you wash only the dirty ones.

Never leave clusters on any longer than necessary, or teat damage can occur, cows can learn to kick clusters off, and cows can learn to dislike being milked. Blue, purple or ringed teats indicate that the cluster has been on for too long, the vacuum is too high, or that there is something else wrong.

High producing cows can produce up to 15% more milk when milked three times a day, but before doing this do the costings.

If you, your staff or your cows don’t like milking check for shocks in the parlor, yard and surrounding area. See Managing Animals>Shocks.

Quality Milk

Established procedures for recording the use of pills, drugs, injections, antibiotic treatments, to avoid inhibitory substances affecting milk, and record their use and procedures in a book for all staff to use and see. Treated cows should have udders colour marked and be kept in a separate herd and milked last.

When administering antibiotics be careful to not transmit any via your hands to milk. This has happened and caused inhibitory grades. After discovering a cow which needs treating, it is best to draft it into a separate herd and then treat it rather than during milking of clean cows.

Milker’s hands can become chapped and cracked which is not hygienic for humans or quality milk production. Modern gloves are so thin and comfortable to wear, that if you aren’t already using them to milk, do so to protect your hands, and against infections such as cowpox, and to reduce spreading teat infection between cows.

Our milk vats are designed to cool half the capacity from 18° to 7° in three hours, so when filling more than one vat put half in each at each milking.

Producing Food

Our food producing and environment regulations are stringent, but well accepted by most farmers because they appreciate all the benefits from the health of the country and the consumer. In fact most of the regulations have been drawn up by farmer run organisations such as councils and dairy co-operatives.

Examples of environmental requirements include the prohibition of any polluted water entering ditches or waterways and not allowing the farming of land within 20 metres of rivers, except by careful grazing.

Food health regulations include not allowing animal smells within 200 metres of dairies. Human health and comfort requirements include prohibition of any smells affecting even passing motorists along public roads.

This would be difficult in small intensive countries such as Holland, but should be aimed for. The odours which come from many Northern Hemisphere farms would not be tolerated in NZ. They would have to reduce them by covering the heaps of animal manure, spreading or injecting it into the soils more frequently and having more concrete where animals stand, to prevent muddy areas, a common sight around many North American dairies.

It is also not healthy for animals to be in muck, breathing ammonia filled air, a cause of pneumonia.

New Zealand has had the benefit of high power fencing to allow easy and low cost fencing to give animal control and good pasture management since the 1960's, however it has also been available in the Northern Hemisphere for several decades so grazing with all its benefits should have increases at a faster rate than it has. Without the ability to economically subdivide farms into at least 20 paddocks per mob - the New Zealand term for a group of grazing animals - our production costs would be prohibitively high.

Cheese manufacturing in particular needs a stable quality milk. All year round milking in a temperate climate achieves this better than in extreme climates and with seasonal milking when cheese moisture rises unsatisfactorily at the end of the milking season.

Milking staff

In some countries milking staff are paid by the hour. This is most inefficient and costly because it discourages speed. The longer the cows are in the parlor the more muck, the more likelihood of bloat after milking, and the less time they are grazing. In New Zealand contract milkers are paid by the volume of milk solids produced and sharemilkers get a share of the milk cheque.

A dairy farmer in USA changed from paying two milkers per hour in a ten a-side herringbone to paying per 100 lb of milk. Previously two milkers set up each milking, milked and cleaned up. 300 cows were milked three times a day. When paid on production, one did it on her own in less time than two, showing how much some can waste time talking. The farmer's labour costs dropped and his milk production increased. Somatic cell counts and mastitis remained the same.

Staff were dubious about the change, some left, but those remaining preferred it because they milked faster and made more per hour.

The owner saved more than US$100 per day in wages.

What started the change? Low prices and no profit for the farmer, who had to lower costs somehow.

Because they all milk at the same time, very few milkers see others milking which is the most important task on a dairy farm.

Farmers expect those who apply for positions to know how to milk, but they may not, or, worse still, they may have some bad milking habits. Training is important, supported with written instructions, as is done in many industries. Discuss the subject with job applicants to ensure that

they don't have bad habits.

The first thing to find out from potential milkers is if they love cows and livestock, and show them the same tender loving care (TLC) shown to friends and family. Even the verbal abuse (shouting at cows or each other) which occurs in many parlors discourages extra "free" milk.

Two of the top dairy farmers I know move very slowly through their cows and speak softly (cows are not deaf) and kindly to them. Their cows in turn move calmly and this treatment, which cows love, helps these two farmers produce nearly twice their area average. These principles apply to handling all stock.

Milking machines should not be old slow ones because surveys have shown that milk production can suffer and the incidence of mastitis can be higher.

Vacuum levels should be no higher than 40 kPa for low lines, 44 for high milk lines 1.4 m above where the cow stands, 46 if 1.6 m and 48 if 1.8 m above. Vacuum levels may have to increased or decreased during milk testing, depending on the height of receptacles.

The best way to improve milking efficiency is to video milking for a week or more. One milking is insufficient because milkers will do what they know should be done, but after a few days will revert to their habits which will usually be what they were allowed to do in their first days of milking.

The camera should be as far away as possible, but sound must be recorded with a remote microphone if necessary to pick up the rushes of air. Also film the vacuum gauge for a while.

Before videotaping, discuss it with the people concerned. Explain that many companies use videos to improve time management, sport people watch themselves and sports managers use videos to point out techniques. If you are an owner/milker you will learn something from videotaping yourself, I'm sure.

What made me realise how useful videotaping milkings could be was after making a video on milking and viewing it I saw things I hadn't noticed in the parlor, despite having seen the particular milkers in action dozens of times. The excuse I made to myself was that I was always talking with the milkers, observing the cows and enjoying being in a parlor again - for a few minutes, that is, and seeing that liquid gold pouring out of udders.

As well as not noticing milker mistakes, I hadn't noticed minute flies worrying the cows. On the video where one looks at and sees only the specific area, one sees more than when one can see the whole area the eye encompasses. Also a zoom brings things closer like binoculars.

All milkers will agree that cows like and should have consistency with the same routine every milking and that cows hate shells being "clipped" onto teats, pulled off too hard and being startled. Most milkers will believe that they are good milkers and achieve all these requirements.

When they see the video they will be amazed.

The vast majority I've seen, including herd owners, hold the clusters too low so air is sucked in before reaching the teat. This causes the cups to 'clip' onto the teat which cows don't like. It also causes vacuum fluctuations which cows don't like. The reason for holding clusters too low includes; the pit being the wrong depth, the milker being tired and the milker not realising what they are doing and the ill effects they are causing.

Discuss the viewing positively and allow the milker to make most of the comments. Most know what should and shouldn't be done, but as said, discuss with them and have them and you write down the things to improve when milking.

The video may show that some switches, water taps and other frequently used items are in the wrong place and should be moved. Be prepared to do fix these things.

Other things which may be revealed include:

- One cluster always slow because it is faulty.
- How much slow-milking cows lengthen milking time. You can time them.
- Whether more clusters are needed.
- The accuracy, or inaccuracy, of teat spraying. Some casual flicks with the wand miss and teats may not get fully covered.
- Crowding the cows too tightly with the backing gate.
- What makes cows muck.
- One end of the parlor milking faster than the other because of a milking machine fault such as to milk pipe being too small or too level and/or the milk pump being too slow or too small.
- Erratic shocks making some cows jump occasionally.
- The height of the front and/or back rail needing changing.

Changing in mid-lactation from twice to once a day milking (OAD)

A seasonal (all cows calve within about six weeks) herd can be changed from twice a day to OAD about five months after calving, before they have dropped too much in milk production (still producing about 75% of peak) and before the somatic cell count has gone up too much and while there is still ample pasture to feed well.

Daily production will drop, but then go up again. Most cows will produce less for the lactation, but will hold condition so that they can be milked for longer into the winter and still be in better condition.

When production drops through heat and/or lack of pasture, it can be more profitable to milk the herd OAD. The drop in total production for the late milking period concerned is usually only about 5%, but if you are a little short of feed there may be no total drop, or if very short of feed, the milk will obviously keep dropping. The 5% can be regained by milking for about a week longer, if autumn pasture is available, rather than trying to milk twice a day in the heat on very little dry pasture. The decision has to be made whether to milk twice a day for a shorter period or milk for slightly longer on OAD. To milk a cow in NZ costs 12 to 17 cents per milking, so calculate your milking costs (your time, power, wash water, detergents, water heating, wear and tear on plant and lanes), against income, to work out when you should change to OAD.

If short of feed, dry off and/or sell the low producers, whether on OAD or not.

Some change to OAD about t between two and five months after calving. Don't leave changing too late and don't do it during a stress period such as extreme heat, cold, wet, poor paddocks, hunger, etc., because milk will be dropping anyway and could drop further than just because of OAD, and not increase again. If milk production per cow is low the SCC can increase on OAD. If you have a high SCC herd, OAD could increase the count because the somatic cells have less milk in which to be diluted, so dry off the high SCC cows and treat them. These are usually the old ones and those which have had mastitis. Giving them a longer rest from milking may help the udder recover better, but not too long, which has proven to increase subsequent SCC. I have not heard of the reason for this. They may need another shot of Dry Cow Therapy which must be at least a month before calving (check the instructions), or use teat plugs.