CSI: CowSide Investigation

Cow cooling to improve performance

By Dr David A. Reid, Director of Milk Harvest, Science and Technology

Now is the time to think about how to maximise milk production and improve cow comfort during the period of warm weather that will be coming in a few months.

The biggest single heat stress location in many herds is the holding pen. Cows are crowded together and some cows can spend up to 1.5 hours in the holding pen at one milking. If the core body temperature increases by 0.5 to 1°C it may take as long as four to six hours for the cow to bring this back into the normal range depending on the environmental conditions.

The major impacts for the cow and herd are lowered intake of feed, lower milk production and a much higher incidence of subacute rumen acidosis due to slug feeding when the body temperature drops.

Depending on how many occurrences of acidosis a particular cow experiences, there will be an increased new mastitis infection rate and the occurrence of hoof lesions due to the acidosis.

Lame cows along with more mastitis will always lower parlour performance even when the milking equipment is functioning at high levels.

Arizona research has demonstrated that when cows were cooled in the holding pen, milk production increased 1.7lb or 0.78 litres per day during the summer. Low volume sprinklers and fans can be used to wet cows and speed evaporation of the water off the cows' backs.

Fans should operate continuously providing a minimum of 1,000 cubic feet per minute or 28.5 cubic meters per minute per cow. Fans should be mounted overhead and the air should be blown downward at a 30 degree angle.

Fans of 36 to 48 inches or 0.915 to 1.22 meters in diameter are most commonly installed. Fans are typically placed side by side spaced six to eight feet or 1.8 to 2.4 meters apart. The distance between rows of fans is 20 feet or six meters for 36 inch or 0.915 meter fans and 40 feet or 12 meters for 48 inch or 1.22 meter fans.

An important consideration is to keep all fans clean so they can move the rated volumes of air during normal operation. Dirty fans do not move air properly. Another very important consideration is when to turn on the fans.

Fans should be turned on at 60°F or 15°C. The temperature should be monitored in the holding pen six to nine feet or 1.8 to 2.7 meters above the cows. This may make some of the milk harvest technicians uncomfortable, but remember the greatest heat stress is in the holding pen.

Whenever cows are taking more than 40 respirations per minute they are experiencing some degree of heat stress due to the primary mechanism of heat dissipation for cows which is increasing the rate of respiration.

Farms that begin to cool cows during periods of potential heat stress find cows more readily enter the parlour and they are more relaxed when they do enter the parlour.

One of the main consequences of improper cooling will be significant increases in claw lesions that begin to be seen six to eight weeks after the first periods of heat stress. These lesions will cause lame cows that can dramatically reduce parlour performance.

Water can be sprayed onto the cows using a PVC grid of 360 nozzles. Water is generally applied one minute out of every six minutes to facilitate evaporation to cool cows.

It is important to have the sprinklers on long enough to wet the cows to the skin for maximum cooling.

Cooling cows as they exit the parlour provides an additional 15 to 25 minutes of cooling per milking (Armstrong, 1993).

Typically three to four nozzles are installed in the exit lane, with a delivery of approximately eight gallons or 30 litres per minute of water when operating.

The nozzles are turned on and off with an electric eye or wand switch as the cow passes under the nozzles.

If properly installed, sprinklers should wet the top and sides of the cow and the udder should remain dry. In this way, the water will not interfere with post dipping sanitation of teats after milking by washing teat dip off teats.

Any dairy that does not have cow cooling in the holding pen will have periods during warm weather of significant heat stress.

It is important to evaluate your facility and install fans and sprinklers to improve production and reduce the health issues associated with heat stress during the coming warm months. ■

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Keeping score of milking

By Dr David A. Reid, Director of Milk Harvest, Science and Technology

If you want to motivate change on a dairy, find a way to keep score. Improving milk quality and milk quantity is about making changes on most dairies. Farms that perform the milking processes with consistency from milking to milking and from one group of milk harvest technicians to the next have the greatest likelihood of maximising both milk quality and milk quantity.

Farms that have milk meters have performance data available after every milking. However, most farms do not post the parlour performance information available from the computer after every milking. The more milk harvest technicians know about their performance, the better they will perform. Some successful dairies will post the entire one page summary of each milking and use coloured markers to highlight key performance indicators on the reports using different colours to bring these key numbers to the milk harvest technician's attention. Green is used for numbers that are normal for that particular shift, yellow are slightly different than normal and red for numbers that need to be improved. Key performance indicators are milk per cow, milk in the first two minutes, average milk per minute, average milking duration, and time in low flow. It is important to know what these numbers are for each milking shift on the dairy. The following are guidelines, but the most important consideration is to establish 'normal's' for all shifts on a dairy. The normal levels will be determined by the cow handling procedures, the procedures and routines of udder preparation and how consistently each milk harvest crew in the parlour carries out these processes. The milk harvest technicians have significant influence and control of these key performance indicators.

- Obviously milk per cow should be consistent from day to day and be as high as possible.
- Milk in the first two minutes – 6.6 litres or kg for 3 x and 8.4 litres or kg for 2 x herds.
- Average flow per minute – 2.95 litres or kg for 3 x and 3.6 litres or kg for 2 x herds.
- Average milking duration – the first 11.4 litres or kg in four minutes or less and each additional 4.5 litres should be an additional 0.5 minutes or less. These are the same for either 2 x or 3 x milking herds.
- Time in low flow – as low as possible, 18-20 seconds is very good for most milking systems on the market.

Additional information that is very helpful to monitor on a regular basis are the start and stop times for each pen on the dairy. Some farms will have a white board in the parlour breezeway that has permanently marked normal times and then space for each milking crew to write in the times on each shift. If a dairy has milk meters, this information is likely available on the computer but by requiring the lead milk harvest technician to write this down during milking allows management to 'keep score' during every milking. Another number that can be easily tracked is milk per stall per hour. This means the total milk produced during a milking must be recorded by reading the tank at the start and end of milking. Additional data is the total time to milk and the number of milking units. Goals for milk per stall per hour are 45 litres or more per stall per hour in 3 x herds and 54 litres or more per stall per hour in 2 x herds.

The level of milk production will determine what the normal levels of these key performance indicators are in a given herd. This is the main reason for the guidelines being different for herds based on the number of milkings per day. Small changes to the udder preparation routines and the cow handling can have marked influence on these parameters. All dairies should strive to minimise the number of cows that have no or very low visible milk flow shortly after units are attached. The ultimate goal of milking is to milk clean, dry, stimulated teats at every milking. Cows will then milk quickly, gently, and completely and key performance numbers will be consistent from milking to milking and milking crew to milking crew. ■

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Mastitis and teat care

By Dr David A. Reid, Director of Milk Harvest, Science and Technology

Milk quality is a moving target on most operational dairies. No matter how well the milking equipment is performing, how clean the cows are when they enter the barn or how efficient, consistent and effective is the udder preparation, there will still be some new mastitis cases on every dairy.

The goal of the dairy should always be the same, to reduce the level of new infections by following all established protocols and always striving to milk clean, dry stimulated teats as quickly, as gently and as completely as possible at every milking.

Minimising milk duration is the single best method to maximise teat end health and condition.

A prime management goal should be to bring all cows to the parlour as clean as possible in a calm manner at every milking. Udder hair should be removed on a timely basis to improve udder cleanliness at milking. Review the actual cow movement to see how cow movement compares to the protocols for the dairy.

When cows are moved quickly they will have significantly more manure splashing onto the udders, teats and the lower areas of the front legs. When manure splash is observed in these areas in the parlour and most of the manure splashes are still wet it means these occurred as the cows came to the parlour or barn.

If most of the observed manure splash is dry then the most likely area of occurrence is on the return from the parlour. Cows should have udders like this and clean udders and legs when they enter the parlour.

All cows should have a quality teat dip applied that covers all teats entirely when they leave the parlour. Quality teat dips not only help reduce the new infection rate, but they also contribute to the overall teat skin and teat end condition. Be sure that coverage is adequate on cows to help reduce the new infection rate and optimise milk quality.

One of the best places to look for post dip coverage is in the return lane when milk harvest technicians do not know their work is being evaluated. Remember the goal is to have the complete teat fully covered with dip!

When mastitis does occur, it is important to take good samples to allow bacteria identification by culture. There should be 15-35% of clinical cultures that come back from the laboratory with a code of no growth. If all clinical mastitis samples contain bacteria it is likely the samples were contaminated during collection.

Teats must be thoroughly cleaned using an alcohol swab or cotton balls soaked in alcohol. Discard the first few streams of milk, then hold the marked sample tube (date, cow ID and quarter) off to the side of the cow and tipped to limit the possibility of having some material come off the udder and fall into the sample tube.

Collected milk samples should be cooled immediately or frozen until they are sent to the laboratory.

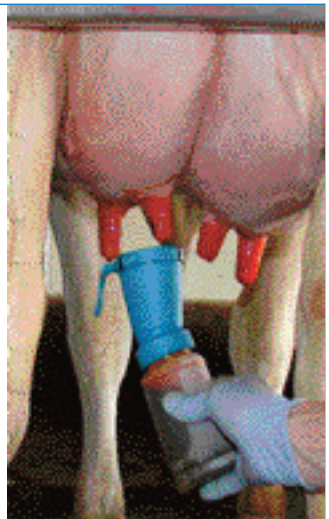
Treatment for either clinical mastitis or for routine dry cow therapy is an important part of a milk quality program. Treatment must be performed correctly to maximise the effectiveness of the product being used.

Treatment protocols should be developed with the assistance of your local veterinarian based on the herd history and available products. If a dry cow program is being used the best way to administer the product, either an antibiotic or an internal sealant, is immediately after the cow is milked at the last milking.

Remove the unit from the cow then apply normal teat dip. Wait at least 30 seconds and then dry the teat with a cloth towel. Now take an alcohol pad and clean each teat. Start on the far teats and clean until the teat ends do not stain the alcohol pads.

Now clean the closest two teats in a similar manner. Place the dry tube against the teat orifice and then inject the antibiotic into the closest teats first. Now infuse the far teats in a similar manner.

If an external sealant is going to be used, dry the teats again with a cloth towel using a circular motion on each teat. Now apply external sealant/ barrier type product to seal the teats. Move cows to the dedicated dry cow pen. Only use single dose commercially prepared tubes as recommended by your veterinarian. Do not use locally mixed products that can become contaminated during mixing.



Treatment for clinical mastitis is performed in the same manner being very careful to properly sanitise the teat end before infusing a commercially available product. All treated cows should be identified in a manner that all milk harvest technicians will recognize to allow appropriate milk discard. Accurate record keeping when cows are treated is essential to allow proper discard of milk and to monitor the effectiveness of the treatment protocols.

Research indicates that cows with five or more clinical cases of mastitis in one lactation are responsible for over 50% of the mastitis cases in the average herd. Remember that appropriate culling is also a component of a milk quality program.

Proper training of all milk harvest personnel, milking quickly, gently and completely, following carefully developed treatment protocols and culling chronically infected cows is the key to maximising milk quality. ■

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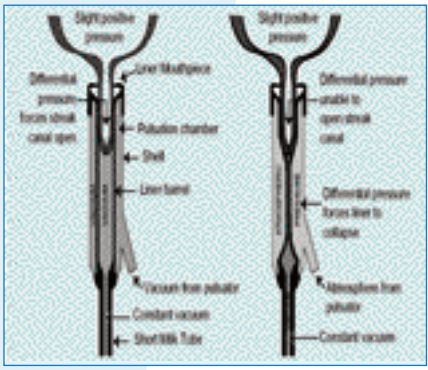
The purpose of pulsation

By Jerry Slattery,
Director of Global Training

While pulsation is critical for milking performance and udder health, it is not always well understood and, in many cases, is taken for granted. The main purpose of pulsation is to limit the development of congestion and oedema in the teat tissues during machine milking. In addition, or as a consequence of this primary function, pulsation helps to:

- Maintain a high rate of milk flow from the teat within each pulsation cycle.
- Counter the possible ill-effects of teat congestion and any level of discomfort experienced by the cow.
- Reduce the rate of new mastitis infections.
- Stimulate milk ejection.



Pulsator rate and ratio are typically the main focus when it comes to characterising the pulsation system. Pulsation rate is defined as the number of complete pulsation cycles per minute.

Most milking machines operate efficiently with pulsation rates between 45 and 60 cycles per minute. Pulsation ratio is defined as the percentage of time the inflation is in the milking phase or the rest phase. A pulsation cycle can be divided into four main phases:

- Increasing vacuum phase – when the vacuum level in the teatcup pulsation chamber increases from atmospheric pressure to the machine vacuum level. During this phase the liner starts to opens and milk flow commences.
- Maximum vacuum phase – when the vacuum in the pulsation chamber is similar to the vacuum inside the liner barrel. Consequently, the liner is open and milk is flowing.
- Decreasing vacuum phase – when the pulsator connects the pulsation chamber to air at atmospheric pressure. As the air enters the pulsation chamber the liner collapses and milk flow stops.
- Minimum vacuum phase – when the pulsation chamber is at atmospheric pressure. The liner is closed and exerting a maximum force on the teat.

A vacuum recorder can be used to monitor and evaluate changes in the pulsation chamber vacuum. The graph produced can be measured to show each phase as a percentage of one cycle.

This gives a four figure ratio, for example 15:45:15:25, means that the liner spends 15% of a cycle opening (increasing vacuum phase), 45% fully open (maximum vacuum phase), 15% closing (decreasing vacuum phase) and 25% fully closed (minimum vacuum phase).

Connecting a vacuum recorder and graphing the pulsators is the only way to determine if pulsators are performing to peak performance.

Pulsators should always be graphed with unit attach and teat cups plugged or attached to cow.

In many parlours the number of hours milking has increased. To keep the system operating at peak performance, the implementation of regular scheduled maintenance is critical. Follow the manufacturer's maintenance recommendations for cleaning and installing maintenance kits in your pulsators. Seldom do pulsators completely fail; they generally degrade, because of dust, dirt and debris within the parlour environment.

Ask yourself how many of your prized cows do you want to put at risk, then consult your milking equipment dealer for questions regarding pulsation performance and maintenance. ■

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The economic consequences of mastitis

By Carolina Pinzon, BouMatic Global Training Instructor

Mastitis is an inflammatory response of the mammary gland caused by bacterial infection and is the most common and costly health disorder of dairy cows.

Depending on its presentation, mastitis is classified as clinical and subclinical.

Mastitis can remain as a subclinical infection or progress to produce clinical signs. In subclinical cases no evident signs of mastitis, such as abnormal milk or swollen udders, are observed.

The measurement of somatic cells (California Mastitis Test) or milk cultures are the only way to detect subclinical cases. On the other hand, cows presenting clinical cases will have observable signs of mastitis.

Clinical mastitis is often classified according to severity of the symptoms. A common classification system has three levels:

- Mild – milk looks abnormal.
- Moderate – milk looks abnormal and in addition the udder or quarter is swollen.
- Severe – the cow exhibits systemic signs.

When calculating costs of mastitis, dairy producers usually include expenses such as extra labour, drug treatment, discarded milk and veterinarian costs only.

Several studies in the United States have reported that the average cost of a case of clinical mastitis ranges between $91-179.

Certainly, those costs are important, but most of the time the effects that are not so evident are taken for granted.

This is the case of milk production losses due to subclinical and clinical mastitis, and reduction in milk quality.

Losses are defined as revenue not earned, while the costs are real expenditures. Both have to be addressed to obtain the total economic impact of mastitis.

Short term costs include treatment, veterinarian assistance, extra labour, milk discarded during and after antimicrobial treatment, and loss of premiums due to increased somatic cell count of the bulk tank milk.

Other potential losses are due to the risk of contamination of a load of milk if treated milk is accidentally poured in the bulk tank, potential transmission of contagious pathogens, potential loss of mammary gland quarter and premature culling.

Cows that experience clinical mastitis rarely recover their potential milk yield.

The effect of clinical mastitis on milk loss varies depending on the severity of the case, the number of cases in the previous and current lactation, the age of the cow, the stage of lactation when the disease occurred and the causative pathogen.

When cows do not experience bacteriological cure, reduced milk production is assumed due to the effects of subclinical mastitis.

Milk loss has been estimated as 0.4kg/day for primiparous cows and 0.6kg/day for multiparous cows for every two-fold increase of somatic cell count greater than 50,000 cells/ml.

In addition, mastitis not only results in loss of milk production (due to the loss of epithelial cells), but the composition of fat, protein and minerals is altered, causing a reduction in milk quality.

However, due to the withdrawal period after treatment, composition changes in milk can almost be neglected in economic calculations.

From the above discussion we can think that a healthy cow (with no clinical or subclinical mastitis) has the potential to produce a 'full' tank of milk during her lactation.

However, a cow with clinical mastitis will automatically reduce her potential production, due to discarded milk, clinical and subclinical milk losses.

The goal of dairy farming is to produce the maximum quantity of quality milk from healthy cows with minimum expense.

Prevention and use of best management practices aimed to reduce cow's exposure to pathogens are recommended to avoid detrimental economic effects of clinical and subclinical mastitis. ■

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Evaluating liner performance

By Jerry Slattery, BouMatic Global Training Director

Modern cows produce more milk in less time with good farm management conditions and from using high performance liners. With over 600 varieties of liners available worldwide, choosing the best liner for your cows can seem complicated and overwhelming.

Liners are the single, critical point of contact between your milking system and your cows. Today's high performance liners should balance slips and squawks with gentle, quick and complete milk out. Research has shown that dairies with greater numbers of slips and squawks are more likely to have a higher incidence of mastitis.

To achieve the best milk harvest, teats must remain open and free from congestion at two areas: the teat end and the area at the mouthpiece of the liner. Evaluating liners starts in the milking parlour and can be as easy as letting your cows tell you if the liners are performing well, or not.

Observe cow behaviour during milking:
Are the cows comfortable during milking? Do they stand still or do they step, kick and flinch during the milking process? Cows milked with high performing liners and a good milking system should be calm during milking and when the milking unit is removed. Other factors may influence cow behaviour, including methods of moving or milking the cows, milk harvest technicians, preparation routine, detacher settings, unit alignment, milk hose path, average vacuum at peak milk flow and pulsation.

Observe cow behaviour and teat condition after unit is removed:
Right after the unit is removed check cow's resistance to stripping. Pay attention to the teat end and the barrel of the teat. If there is discolouration, or ringing, the cow was not comfortable during the milk harvest process. There should be very little resistance to being stripped; if cows step, flinch or kick it indicates discomfort. Recommended strip yield for cows is 250-450 ml of milk left in udder right after the milking unit is removed. Cows with excessive hyperkeratosis are generally being over milked. In these cases it is best to have your dealer analyze your system and make the necessary changes to reduce over-milking.

Change liners as often as recommended by the manufacturer:
Aging liners produce a decreased peak milk flow rate, increased vacuum fluctuations, increased milking duration, and decreased mouthpiece chamber vacuum. Wash chemicals can affect the life of liners especially if chlorine levels are higher than recommended for cleaning the system. Observe cows after a liner change. High performance liners do not need a break in period. If the cows milk better after changing liners, it means the liners were worn out and should be changed more frequently.

Use management reports:
Today's automated systems have parameters and reports for milk-per-cow, seconds-in-low-flow, milking duration, peak flow rates, kilograms in the first two minutes and reattachments. These factors can be used to evaluate liner performance.

Improving 'milkability' with high performance liners and a system correctly setup to milk today's cows, can have an immediate impact on your bottom line and should not be overlooked. If you have questions concerning your liners or milking system consult your milking equipment dealer and ask them give your system its annual inspection. ■

Excessive hyperkeratosis.