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InfoSheet

AUTOMATIC MILKING SYSTEMS

Key Points:

- Regular maintenance is the key to preventing alarms and breakdowns.
- Develop a daily routine that includes maintenance.

Routine maintenance for large herd automatic milking systems

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Maintaining a clean automatic milking facility keeps the plant in good operating order, thereby minimising unscheduled breakdowns. Most automatic milking farmers learn very quickly that regular (daily) maintenance is the key to preventing overnight alarms. It is up to you to incorporate maintenance into a daily routine that suits the people working at the AMS.

For examples of daily routines, refer to FutureDairy AMS labour case studies.

Preventing downtime

With any AMS, regardless of herd size or design it is crucial to follow the manufacturer's recommended service schedule. Servicing and preventative maintenance is much more important for preventing downtime in automatic milking systems than conventional milking farms.

Unplanned downtime is costly through its impact on milk production, cow flow (which make take a week to recover) and stress on the people involved.

In addition to scheduled servicing, the two most important tasks to prevent downtime are regular cleaning of external surfaces and maintaining cows in a condition that makes it easy for cup attachment.

Cleaning external surfaces of equipment

Every dairy farmer knows the importance of maintaining a high level of plant hygiene for milk contact surfaces. Cleaning the external surfaces is much more important in an AMS than a conventional milking system. External equipment surfaces that require regular cleaning include milk tubes, robotic arms, the milking platform (robotic rotary) or crate floor (box AMS), camera lenses and photocells on automatic drafting gates.

Dirt, dust, cow urine and manure are very corrosive and abrasive. The performance of an AMS is likely to deteriorate considerably if equipment – especially moving parts – are not kept clean. Make sure you have a regular cleaning routine.

Thorough cleaning of the equipment often allows the operator to become aware of impending equipment failures and to fix them or call a technician thereby eliminating the inconvenience of a breakdown through prevention. Thorough and regular cleaning can also allow the operator to prevent many minor alarms and the inconvenience associated with these.

External surfaces should be cleaned daily. A good time to clean external surfaces is when the system wash is being conducted. The absence of cows in the milking area means the cleaning process does not disturb them or have any effect on cow traffic, milking performance and behaviour. With the robotic rotary, cleaning during the system wash allows operators to work in areas that are restricted when the platform is in automatic mode.

The daily cleaning process provides a good opportunity to check the condition of milk tubes for splits and cracks. When scrubbing the robotic arms check them for any looseness or 'play' in their movement.

A foaming bottle/gun and a high pressure cleaner will make the cleaning process quicker and easier. Use a foaming spray liberally on equipment that has already been wet down. Systematically work your way around the platform or between the AMS box units. When you have finished foaming the equipment you should be able to go back to the starting point and commence the cleaning rinse.

Always follow up unusual sounds. In a working environment such as a dairy, there are noises and sounds that are characteristic of the milking equipment. An uncharacteristic noise or sound in an automatic milking environment is likely to be associated with a piece of equipment failing or malfunctioning. Prompt follow up will prevent reduced performance, alarms or downtime.

Above: Cleaning the external surfaces of milking equipment is much more important in an AMS than a conventional dairy.

Lasers/camera lenses

Clean the lasers/camera lenses several times a day - each time staff are in and around the dairy. This small, regular effort will ensure a high proportion of milkings are successful and therefore will reduce the time and effort that might otherwise be required in monitoring and assessing cows that have had failed milkings. More successful milkings means better voluntary cow movement: cows will associate the dairy with a comfortable, relaxed environment with predictable routes and be willing to walk to it.

If you have a couple of people on the roster for after-hours callouts, consider giving the person rostered on-call the task of routine maintenance and cleaning on those days. They directly benefit from the effort they put into cleaning equipment during the day by minimising the number of after-hours callouts.

Right: Cleaning camera lenses several times a day is an easy way to prevent overnight alarms.

Robots

Robots should be checked during routine cleaning and while operating. Make sure the robot arms are operating smoothly; jerky or delayed actions could indicate loose bearings and/or bolts that may need fastening or servicing.

Robotic rotary: The milking platform of the robotic rotary should be treated as any of the other milking equipment. Clean and check moving parts during routine cleaning and maintenance. Look out for loose fastenings or any unusual wear and tear of the steel work. Pay particular attention to the swinging separation bails. These need to swing freely otherwise they can halt platform rotation (a weekly check with monthly preventative maintenance should suffice). Check the drive units and roller bearings are running optimally. Conduct a weekly inspection under the deck especially if manure is particularly loose as it can splash into less visible areas and can build up over time. If needed, milking points that are not performing optimally during milking can be deactivated. Consult the manufacturer's guidelines or your local dealer for additional support if needed.

AMS box robots: Clean and maintain the crates(s) or box(es) just as any other part of the installation. Check for loose panels; make sure the gates are swinging freely. Check the cow position indexing device is clean and functioning (if there is one in your installation). Regularly clean the feedbins in the boxes. Every day, hose away any spilt feed that has fallen into crevices behind, under or around the feedbin.

Automatic drafting gates

Regular cleaning of photo sensors on automatic drafting gates will improve the performance. The gradual build-up of dust and dirt can reduce the effectiveness and accuracy of drafting resulting in cows being sent to the wrong destinations or eliminating the gate from operating at all which will eventually lead to cows being trapped within an area of the dairy. This can create a congestion risk if cows are prevented from entering or exiting the milking area.

Always investigate the automatic drafting gates if they are seen to behave erratically or take longer than normal to respond to a cow. A photocell or sensor may need cleaning or may be slightly misaligned. If the gate directed a cow in the direction that you saw her being drafted, it will definitely be because of the settings you have in place. Take the time to find the setting and modify it. Fixing all gate issues promptly is essential to maintain cow traffic and cow confidence with the gates. It is much easier to fix gate issues during the day than at night when it is dark and you have limited help. Gate problems are often only brought to your attention through the incidence of idle alarms. However a higher than normal level of failed gate passings can be an early warning of a pending malfunction. Your daily monitoring reports should show this.

Above: Clean photosensors on automatic drafting gates daily to prevent overnight alarms.

Feed stations

Check the feeding system daily. Make sure the feed stations are delivering feed and match software settings. For example, damp or wet concentrates may impair feed delivery. Cows missing out on their concentrate for an extended period will have a severe impact on an AMS farm in terms of cow traffic, rumen health, milk production, number of incomplete milkings and productivity.

Feed stations should be calibrated and cleaned regularly (according to the manufacturer's instructions). Use compressed

air to blow the dust out of the electronic housing compartment on a regular basis. Check the feedbins for foreign objects. Ensure that all feeding stations are being used by the cows. Any that haven't been used over the past 24 hours should be tested in case they have malfunctioned.

Cow maintenance

Just as equipment needs to be maintained, it is equally important to maintain cows in a condition to make it easy for robotic milking equipment to operate smoothly. Keep the udder clean, not just for milk hygiene but also for accurate cup attachment and robotic speed. Trim tail hair and singe udder hair to ensure that the teats and lobes of the udder are kept clean and to prevent debris from hanging from the udder as this will can interfere with the attachment technology.

Udder hair should be singed at the first milking after calving. Singeing is a quick and painless hair removal process that is dramatically easier and quicker than shaving. Use an orange/yellow flame to minimise any discomfort to the cow. When singing the udder hair make sure it is free from stuck debris that could catch fire! At the same time the tail switch should be trimmed. Don't trim up the sides of the tail too much as the tail can easily start to look like a teat if it is tucked around the udder of a nervous cow during the first milking(s)!

The frequency of udder hair singeing is quite farm specific. Some farms report a need to singe cows about four times a lactation while others find that just once at calving is sufficient for most cows with further singeing done on an as needs basis. This might be associated with breed and climate.

Above: Trim tail hair and singe udder hair to ensure that the teats and udder are clean. Debris hanging from the udder or tail can interfere with robotic attachment technology.

If your cows wear collars, check they are tight enough for the transponder (or rumination or activity devices) to sit in the right position. If cows have pedometers, check that mud does not accumulate around them on the leg as this may impair identification and/or cause foot problems.

System cleans and timing

Vat wash

Your routine for vat washing will depend on whether or not you have a buffer vat. A buffer vat is a smaller milk collection tank that allows the AMS/robotic rotary to continue milking cows even when milk is being collected by the tanker and the main vat is being washed. The main vat is usually cleaned and drained prior to the transfer of milk from the buffer vat to the main vat (at which time the buffer vat is subsequently cleaned).

If there is no buffer vat, milking must stop while the milk is collected and the vat washed. If this is the case, it makes sense to conduct a full system wash at the same time. If for some reason this is not desirable then at the very least a full system rinse should be conducted to ensure that bacteria does not multiply in the plant during the vat washing period.

Above: A buffer vat allows automatic milking to continue during tanker pickup and while the main vat is being washed.

Robotic rotary

Depending on how the robotic rotary is used, up to three system washes may be needed per day. System washes in the robotic rotary cannot be conducted completely automatically and require an operator to prepare the plant for cleaning and start the system wash. The operator is also required to prepare the plant for milking at the completion of a system wash/rinse.

The timing of system washes are influenced by convenience for the operator, herd size, milking frequency and the intervals between washes. For example washes conducted at 10pm, 2am and midday would accommodate lulls in cow traffic on most farms but are unlikely to suit the operator and more importantly the variation in intervals between the washes are extreme at 4 hours and 10 hours.

The robotic rotary can maintain a high level of milk quality and plant hygiene with just two washes each day in some instances. The number of required washes depends (at least to some extent) on the level of system utilisation achieved. Two washes are probably adequate for batch milking as the system is shut down during the night. During summer (warmer climatic temperatures), voluntary milking with low cow numbers (high idle times) it may be necessary to incorporate three washes per day. With lower utilisation levels it is easier to incorporate the three washes without negatively affecting cow traffic. For detailed procedures around the scheduled system washes, refer to the manufacturer's operating instructions.

Individual bails on the robotic rotary can be shut-down or deactivated if they remain idle for a specified period of time (recommended 0-40 minutes maximum); consult with your local milk quality specialist/regulator to find optimum time thresholds. If this function is used the number of active bails will generally decline between washes. The rate of decline will depend on the utilisation level. The challenge is coping with periods of very low throughput such as the early hours of the morning when there is a tendency for much fewer cows to move to the dairy. If the entire system is idle for more the maximum threshold, all of the bails will be deactivated and should not be reactivated without putting a wash through the system to remove the stale milk residues. This threshold has some flexibility and milk quality may be able to be maintained if this is extended during cooler weather.

The operator can choose to manually deactivate some clean bails immediately after a wash has been put through the system. This allows the throughput potential and the anticipated throughput to be better matched. The additional advantage of this is that the operator has clean bails that can be activated strategically during the interval between washes if they feel that the number of active bails drops to a critical low level. The operator can be alerted

if the number of active bails is reduced to a certain number to ensure that the system does not operate with a very low number of bails particularly if the number of cows waiting in the pre-milking waiting yard has increased.

Working with auto-bail deactivation and manual bail activation has some challenges and further research is needed to develop guidelines around these functions. The challenge is to pre-empt voluntary cow traffic and the throughput that is likely to be achieved in the coming hours. Individual farmers generally become very familiar with anticipated traffic and visitation particularly when the system is well managed with careful allocation of feed incentives.

Above: Individual bails on the robotic rotary can be shut-down or deactivated if they remain idle for a specified period of time (recommended 20 minutes maximum).

AMS boxes

The number and timing of rinses/washes with AMS boxes is much more flexible since the process is completely automated. Try to time washers to occur at times of low traffic without compromising the interval between washes too much. Remember you have the flexibility to automate rinses with the individual boxes after settable periods of idle time. This will help minimise the possibility of bacteria multiplying in the machines and milk lines.

Dealing with downtime

Any equipment downtime is disruptive to a voluntary milking herd. Having procedures and protocols in place will minimise the impact on both cows and people. This section addresses ways to deal with both unscheduled and scheduled downtimes.

With multiple AMS boxes, downtime of a single box has less impact on the herd as milking can continue through the other box/es. It is rare to have a general system failure with multiple box AMS. However this is not the case with the robotic rotary. With the robotic rotary if one of the teat preparation modules (TPM) or one of the cup attachment modules (CAM) fails, the TPM or CAM will take control of the teat cleaning or cup attachment process respectively with a reduced throughput. If there is a full robot failure the farmer can also manually milk the cows in the robotic rotary.

Unscheduled downtime

It is often difficult to predict how long it will take to recommence milking after an unscheduled downtime. However, an estimated time should be targeted to enable decisions to be made around the immediate management of the milking herd. FutureDairy generally assessed downtime on the basis of three timeframes: brief (less than 1 hour), moderate (1-3 hours) and extended (more than 3 hours).

Brief downtime

If the downtime is likely to be relatively brief (less than an hour) the easiest and least disruptive option might be to leave all the cows trafficking without changing any gate settings. This way unmilked cows and milked cows don't get mixed up and won't require re-drafting. A short shut-down is probably no worse for the cows than a system wash being instigated. Always consider cow comfort and provide access to water in the waiting yard. If it is hot or humid, turn on sprinklers to prevent heat stress.

Moderate downtime

If the unscheduled downtime is likely to last for a moderate period (say 1-3 hours) consider allowing all cows that come to the dairy to access the feed stations and/or the supplementary feed on the feedpad (if you are currently supplementing on the feedpad) and/or give them access to a small pasture allocation nearby. This may occupy the cows for 2-3 hours and will ensure that when milking recommences they can be guided into the waiting yard, milked and walk directly to pasture without the need to stop for feed after exiting the dairy. Expect a reduction in trafficking speed when milking recommences as cows will likely have a belly-full of feed and some may be more inclined to loiter and ruminate; others will be very keen to progress through the dairy to access a more comfortable surface after standing on concrete for so long.

With the robotic rotary it is possible to park the robots and manually milk for 30-60 minutes to milk a backlog of cows. Manual milking in the robotic rotary is 30-50% quicker than robotic milking, so it can be a good way to catch up on unscheduled or scheduled downtime.

Above: During a moderate downtime, give cows access to the feed stations or feedpad while they wait for milking to recommence.

Extended downtime

On occasions an even longer down-time may be anticipated. Regardless of how you manage this it will likely take some time for voluntary cow movement to settle back into a 'normal pattern'. How you handle this will depend on whether or not cows have access to supplementary feed at the dairy.

An immediate action could be to increase the size of the current pasture allocation in the paddock which cows are expected to be moving out of. This will help to encourage the cows to stay in that paddock for longer before walking to the dairy. Any cows that do walk to the dairy could be redirected to either the feedpad or to a paddock that is close to the dairy so that they are handy for later fetching.

If you have a robotic rotary, consider conducting a 'manual batch milking' when the equipment is back up and running. With 30-50% faster throughput, this will reduce the backlog of cows with milking permission in the milking area.

Although it is not always possible, try to avoid locking cows in any paddocks because they may be less willing to leave the paddock voluntarily when the equipment is back up and running. Sometimes this is the easiest way to manage an extended downtime with a large herd and the negative impacts are likely to be very minimal if it only happens on the odd occasion.

Scheduled downtime

Scheduled downtime gives you the opportunity to prepare for the event. Advance planning is particularly important if the downtime is likely to be for an extended period. Consider some of the following options.

- Before the scheduled downtime offer cows a smaller than normal pasture allocation. This will encourage them to return to the dairy early to be milked prior to the downtime.
- If you have a robotic rotary, conduct a 'manual batch milking' session before the downtime to minimise the number of extended milking intervals generated through the outage. Consider 'sweeping' cows that are on their way to the dairy. Manually milk these to increase throughput and create a forced 'idle time' (see earlier section on moderate/extended downtime).
- Provide a larger than normal pasture allocation during the downtime to encourage cows to remain in the paddock during the outage.
- If you have a robotic rotary, also conduct a 'manual batch milking' session immediately after the downtime to clear the backlog of cows that have milking permission.
- Carefully consider the timing of a scheduled extended downtime. For example, schedule the outage for a period that is likely to have reduced cow traffic at the dairy; or at least at a time of day (pasture allocation) when cows are more inclined to respond to a higher pasture allocation by remaining in the paddock. You will find that some farm areas encourage better voluntary cow movement regardless of how much pasture is allocated. For example your herd might start moving to the dairy at daybreak and this routine might have a tendency to occur for a large proportion of the herd regardless of the pasture residual. On the other hand you might find that pasture residuals have a much greater impact on cow movement during late afternoon/early evening.

Immediately before the scheduled downtime run a system wash to minimise the build up of bacteria in the plant and to allow technicians to work on clean equipment. As soon as the plant is up and running again, you can recommence milking to clear the backlog of cows (rather than wait another hour for a system wash to be conducted). This will also give the technicians the opportunity to watch some milkings after the outage to check the system is running smoothly. They will be less inclined to wait around to observe the initial milkings if they have to wait for a system wash before milking recommences.

A scheduled downtime is a good opportunity for other activities that are disruptive to milking. For example, if the technicians are working on the robotic rotary platform you could change the rubberware on a number of milking points (if they are due for a rubberware change) or conduct some of the weekly or monthly maintenance activities.

FOR MORE INFORMATION

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