



Automatic milking systems

Technical Note B03

Summary

This technical note examines Automatic Milking Systems (AMS) and gives Queensland farmers an insight into how they work, and the benefits, costs and economics of AMS.

AMS farms are designed so that cows move themselves around a farm and get milked, with limited human intervention. The main motivator for cow movement is the provision of fresh allocations of feed and/or concentrates fed in robotic milking units.

AMS changes the way labour is used on a farm and in time can reduce paid and the owner's labour requirements. The amount of labour used for milking will decrease but this labour may be needed in other areas of the farm operation, especially in the first 12 months of AMS.

The first 3-6 months of an AMS can be stressful as cows and humans get used to the new system. There may be milk production losses of 10% in the first year and 5% in the second year.

An economic analysis of AMS found that conventional milking systems provided higher economic returns than AMS. A key variable in this analysis was the relative time savings of AMS and the value owners put on their own time.

Australian farmers who have adopted AMS have been motivated by many reasons including the challenge of something new, the high value they place on their own time, the desire to make the farm attractive to the next generation and problems they have experienced in attracting and retaining milking staff.

What are Automatic Milking Systems?

In Automatic Milking Systems (AMS) cows move themselves around a farm throughout the day and night (with limited human intervention), and in the process of doing this they are automatically drafted into the dairy if they have milking permission. The main motivator for cow movement in a pasture based system is fresh allocations of feed/pasture. As the cows move to look for fresh feed, the automatic drafting system directs them to either fresh feed areas, loafing areas, holding areas for animal husbandry or to the milking machines.

AMS provides a system that will change the way labour is used on a farm and in time has the potential to reduce paid and the owner's labour requirements. It will allow the owners to leave their farm in the knowledge that milking will continue and they will be alerted if there is a problem with the machines.

The uptake of AMS (April 2011)

Worldwide	>10,000
Australia	14
Queensland	3
New Zealand	5

Who might be interested in AMS

Farmers who have adopted AMS in Australia and New Zealand have been motivated by the:

- challenge of something new,
- high value they place on their own time,
- desire to make the farm attractive to the next generation, and
- problems they have experienced in attracting and retaining milking staff..

How AMS works

Drafting system

All cows wear collars. As cows pass readers at drafting gates, the computer system selects where a cow should be sent, for instance:

- to a milking unit,
- to a fresh feed allocation,
- back to an existing feed allocation,
- to a loafing area, or
- to a holding area to await husbandry.

Where the cows are directed is dependant on several criteria including the:

- time of day,
- the length of time since last milking,
- length of time until the next feed allocation becomes available, and
- the operator's request for husbandry.

One way gates maintain the direction of cow movement creating "points of no return".

Milking unit

The milking unit is similar in size to a cattle crush. Once the cow walks into the unit, the entry gate closes and a robotic arm moves cups into place by using lasers to locate teats. The unit prepares the teats for milking, milks the quarters individually, records milk volume, milking speed and milk quality and has the potential to feeds the cow concentrates. There is generally no need for human intervention.

Feed allocation

In a pasture system it is the farmer's role to move fences that allocate fresh feed for cows. The automatic drafting systems will begin to draft cows to these new pasture areas at times set by the owner, for instance 6am, 2pm and 10pm.

Cows are motivated to move in search of fresh feed and as they pass through drafting gates they can be directed to the milking units if required. Some cows may need to be fetched (especially late lactation cows who are not motivated to find fresh feed) so they can be milked.

When conserved feed is required to provide some or all of the cows diet, the supplementary feed can either be allocated on a feedpad or in the paddock.



During periods of 100% supplementation it is generally best to distinguish between feeding and loafing so that cows can be drafted for milking as they move between the two areas (feed and loaf areas).

Systems

In Australia, AMS have been adopted in many feeding systems including:

- pasture,
- pasture and feed pad (Partial Mixed Ration),
- feed pad (Total Mixed Ration), and
- free stall barn.

Infrastructure

One milking unit is required for each 60 to 80 cows (depending on target milking frequency and milk production levels). Specialised milk cooling, vat systems and an office to house the controlling computer are also required.

The farm needs well designed laneways that promote the voluntary movement of cows to pastures, feed pads, loafing areas, night paddocks and husbandry areas. Auto drafting gates and one way gates are usually used to direct and control cow traffic.



Benefits and costs

Labour

The use of labour on an AMS farm is different to that on a conventional farm and labour saving from AMS may take 6-12 months to be realised. The amount of labour used for milking associated tasks will decrease but the impact on total farm labour depends on the proportion of time that was being spent on milking previously.

The scale of the impact on labour is largely dependent on the individual operation. It is often assumed that milk harvesting accounts for about 50% of labour in a conventional system, if milking associated labour is reduced by 50% this would equate to a 25% reduction in total farm labour. This can be realised as a reduction in paid labour, a reduction in the owner's labour requirements or a redirection of labour to improve the management of pastures, nutrition, animal health and reproduction.

Production

There is a perception among some people that milk production will increase with AMS due to cows being able to be milked more than twice a day. While this is possible, it is generally only the case if milking frequency is limiting the cow production levels rather than feeding level being the limiting factor. It also requires that a higher milking frequency and feeding level is actually achieved on farm.

Expectations should be that there is a real likelihood that milk production will not increase in the first 12 months and that in fact it will decrease during this period as the herd and the humans adjust to the new system. There may be milk production losses of 10% in the first year and 5% in the second year.. After this transition period it is likely that milk production will return to the levels prior to AMS.

Animal Health

It is possible that animal health costs will decrease by 5% due to the lower incidence of lame cows. Costs of other animal health issues such as somatic cell counts and mastitis will not necessarily change but they need to be managed carefully.

Maintenance

An additional cost of AMS is the annual maintenance fee charge by service merchants. These annual fees can vary from \$5,000 to \$10,000 per milking unit.



Electricity

The experience of farmers with AMS in Australia and New Zealand has been that the cost of electricity to the dairy is likely to increase by up to 20%. As an industry we do not have a clear understanding of the scale of the increase and how general it is but have estimated that an increase of 20% should be factored into the economic evaluations.

Capital

The major financial implication of AMS is the amount of capital tied up in the milking units and associated infrastructure. The cost of AMS is dependant on the manufacturer, the number of units purchased and the other infrastructure that needs to be installed. For an initial budget, \$250,000 per unit could be used, but a thorough costing is essential since all farms will need different infrastructure and manufacturers offer different packages.

Stress

The commissioning of an AMS system is a stressful time as the cows and humans get used to the new system. However, farmers who have adopted AMS report that in time there is reduced stress, more flexibility and more enjoyment in dairying.



Economics

The Future Dairy team Camden undertook a thorough study of the economics of Automatic Milking Systems (AMS) and conventional milking systems (herringbone and rotary), for four herd sizes ranging from 160 cows to 400 cows. The key messages from this study are summarised below.

Investment in milking facilities is generally a low returning investment but from time to time they must be updated, especially if lifestyle factors are taken into consideration.

They found that for all four herd sizes, the Internal Rate of Return of the conventional systems were higher than for AMS. Therefore investing in conventional systems rather than AMS is, from an economic view point, a better investment.

AMS can be justified when:

- There is a large saving in time compared to the alternative conventional milking system.
- The value placed on that labour is relatively high.
- The initial capital cost of an AMS is only say a maximum 50% greater than the conventional system.

It should be noted that most people who have invested in AMS in Australia were not motivated by pure economics. Their motivations included the challenge of something new, the high value they placed on their own time, the desire to make the farm attractive to the next generation, and problems they had keeping milking staff.

Further information

Contact the DAFF Customer Service Centre by Phone 13 25 23, or
Email callweb@daff.qld.gov.au

More technical notes can be found at:
www.dairyinfo.biz

Future Dairy

The Future Dairy web site has many great resources on AMS including the Management Guidelines for Pasture Based AMS Farms and reports on their research into a robotic rotary dairy. www.futuredairy.com.au

Dairy NZ

The Dairy NZ site also has plenty of information in AMS. www.dairynz.co.nz

AMS merchants

DeLaval: www.delaval.com

Lely: www.lely.com

Insentec: www.insentec.eu

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