The first milking 'robots' were installed on commercial dairy farms in the Netherlands in 1992. In 2008, automatic milking systems (AMS) (also known as voluntary milking systems or robotic milking systems) were operating on about 6000 farms in more than 22 countries, including five in Australia and two in NZ.

- More than 90% of AMS are located in north-west Europe where small family farms predominate, labour is relatively expensive, herd sizes are much smaller and the farming system much more intensive compared with those in New Zealand.
- Automatic installations are also milking cows on at least 20 Canadian farms – Canada has relatively high labour costs, limited flexibility to increase herd sizes on family farms, and very limited opportunity to graze cows on pasture.
- As an indication of the profound changes just around the corner in an entirely different market, some of the largest industrial farms in the United States have started using automatic milking for herds of 2000-3000 cows.

*Figure 1. Several cows waiting their turn at an automatic milking system.*


**Potential benefits**

As the differences between the costs of automatic and conventional systems are reduced, an increasing number of New Zealand farmers may opt for these systems due to:

- improvement in lifestyle, with more time for family and leisure activities;
- less physical work, especially for older farmers or those with health problems;
- increased opportunities for attracting and keeping skilled labour;
- personal choice for innovators who want to try new ideas;
- increased profitability based on the potential to increase milk production (if targeting a higher milking frequency) and lower labour costs;
- a way of increasing herd size without needing to increase labour requirements (better use of existing labour).
**What does an automatic milking system do?**

The following table outlines what AMS can and cannot do.

<table>
<thead>
<tr>
<th>Can….</th>
<th>Cannot…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admit cows to a stall</td>
<td>Bring cows in to milking station</td>
</tr>
<tr>
<td>Identify cows</td>
<td>Treat sick cows</td>
</tr>
<tr>
<td>Determine the expected yield or milking frequency to decide when a cow is due to be milked</td>
<td>Call the veterinarian</td>
</tr>
<tr>
<td>Decide whether a cow is due to be milked, based on operator settings</td>
<td>Inseminate cows</td>
</tr>
<tr>
<td>Dispense feed, as per operator settings</td>
<td>Cure cows already infected with mastitis</td>
</tr>
<tr>
<td>Determine the level of concentrate feeding for the cows</td>
<td>Manage and deliver roughage feeding</td>
</tr>
<tr>
<td>Clean teats</td>
<td>Clean down the milking area</td>
</tr>
<tr>
<td>Attach teat cups</td>
<td>Order semen</td>
</tr>
<tr>
<td>Remove teat cups when flow rate falls to pre-determined level</td>
<td>Refill chemical containers</td>
</tr>
<tr>
<td>Spray post milking teat disinfection</td>
<td>Order new supplies of feed and chemicals</td>
</tr>
<tr>
<td>Allow cow to leave stall</td>
<td>Replace worn or damaged rubber components</td>
</tr>
<tr>
<td>Reject milk, as per operator settings</td>
<td>Service itself</td>
</tr>
<tr>
<td>Record milk yield</td>
<td>Become angry!</td>
</tr>
<tr>
<td>Raise alarm lists, as per operator settings</td>
<td></td>
</tr>
<tr>
<td>Page the operator in an emergency, as per operator settings</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1. Automatic milking systems - getting the expectations right.**

Source: adapted from Baines, 2002.

When combined with a cow traffic management system, AMS can also manage paddock grazing.

**Impact on milk production and quality**

It is still too early to tell if these systems will increase or decrease cow milk production on New Zealand farms. Some increase in milk yield could be expected if the cows are well fed and milk voluntarily more than twice daily. Overseas studies have shown between a 3-11% increase in milk production on farms where the cows are allowed to milk more than twice daily. However in the majority of New Zealand systems, which are predominantly pasture-based increased milk production would not be expected.

DairyNZ undertook an 8 year project to examine the feasibility of automatic milking for New Zealand farming systems – The Greenfield Project ([http://www.dairynz.co.nz/page/pageid/2145836818/Greenfield_Farm](http://www.dairynz.co.nz/page/pageid/2145836818/Greenfield_Farm)). It showed that production per hectare, equivalent to best practice system 2 farms (self-contained with the exception of approximately 100kg bought in meal per cow per year, seasonally calving) can be achieved by milking cows on average 1.5 times per day through an AMS with a walking distance of up to 1km.

Questions about milk quality have also been raised but recent reports suggest that on-farm management tends to be the major factor determining the quality of milk harvested from farms using automatic milking installations overseas – the AMS should not significantly change milk quality.
Cost estimates

Currently AMS are more costly than conventional herringbone or rotary dairies. There are also differences in operating costs that need to be considered, including a higher annual service fee for maintenance, replacement parts and 24 hour on-call support.

- The original economic evaluation carried out by DairyNZ showed that the cost of producing 1kg MS was 27% higher in an AMS than in a rotary dairy milking 450 cows. However since these calculations advances in cow throughput and grazing management have reduced this gap.
- A major factor driving the economics of automatic milking is cows per AMS installation, and it is important to choose the right number of AMS for your herd size and farm system type.
- Up to 90 cows can be milked by one AMS, although this will be at a milking frequency less than twice a day (around 1.5 milkings/day per cow, on average).
- As new technical developments occur the economics of automatic milking will undoubtedly improve and it is only a matter of time before it will challenge the conventional milking methods for profitability, particularly for medium size herds.
Challenges

Farmers who have changed from conventional systems report the biggest implementation challenges have been:

- Learning to let go of the task of milking and to utilise the extra time to manage the farm as a business and to monitor the herd in other ways.
- Leaving the cows alone to learn from other experienced cows about how to enter the milking system voluntarily.
- Learning to be competent with computers in order to access and understand the information needed to manage the herd.
- Learning how to combine good pasture management with good cow flow through the AMS.

Because milking is a 24 hour operation, system failures can occur any time of the day or night:

- Good maintenance will decrease the number of failures but someone still needs to be on call at all times.
- The successful deployment of automatic milking systems in New Zealand will need to be supported by a regional network of skilled technicians who have been trained overseas or in new local training programs for installation, service and maintenance.

Figure 4. This picture shows cows grazing to residual pasture while others have left the paddock and are walking to the dairy for milking or are returning after milking and on their way to another paddock. Source: DairyNZ Greenfield Project.