

Udderly fantastic

The days are long gone when milking a herd required a three-legged stool, a bucket, a spare day and – preferably for the cows – warm hands. But even modern automated systems have needed human intervention until recently. Duncan Peberdy investigates

Let's be honest, if you were asked to come up with a list of business processes still waiting to be revolutionised by computerisation, I doubt the humble dairy farm would feature in your selection. But in the countryside, out among the green pastures, technological progress is leading to vast improvements in productivity, animal welfare and quality of life.

Milking has always been a hands-on, labour-intensive job. To maximise yield cows have to be milked twice a day – whatever the weather.

Since 1850, when the first milking machines appeared on the market, farmers have used them to increase production. Early devices consisted of tubes that were inserted into the teats to force open the sphincter muscle and allow milk to flow out. The process was physically injurious to the cow and believed to spread disease. It's hardly surprising this primitive setup caused widespread dissatisfaction among dairy farmers.

But with a human able to milk only six cows per hour manually, the pursuit of devices that would emulate either hand milking or the natural actions of a suckling calf continued.

By the late 1800s foot-operated vacuum milkers were common. In time, they were superseded by steam-driven models. Though this lessened the time needed to milk each cow, the machines did not fit well on the teats of many cows and they couldn't always milk a cow to completion.

In the 1920s, pasteurisation, better refrigeration and improved transportation all combined to increase the distance milk could be moved before it spoiled.

By the 1960s, when bulk storage became possible on almost every farm, it was clear that only those farms prepared to invest in technology and produce more milk would survive.

Modern automation allows a herd of 150 cows to be milked by a single person in a little over two hours. The whole herd is usually contained in and around the milking parlour until the last cow has been processed.

Depending on the size and layout of the parlour, as many as 50 cows can be simultaneously stalled to allow for the efficient connection and removal of the milking apparatus to and from the udder.

Keep teats neat

The cows' udders, particularly their teats, are thoroughly cleaned immediately prior to them being hooked up to the machine. This ensures the quality of the milk and restricts the spread of disease.

If the system has to wait more than 15 minutes between milkings it automatically begins an equipment cleansing cycle.

But even this seemingly high level of automation has its drawbacks. For a start, not all cows produce milk at the same speed and so a percentage of cows are in the milking parlour

ahead of their optimum time. And for fast-producing cows, milking twice a day is not enough to maximise their economic potential to the farm.

What's more, having to wait around in the milking parlour before or after milking can be unproductive and stressful for the cattle.

No human required

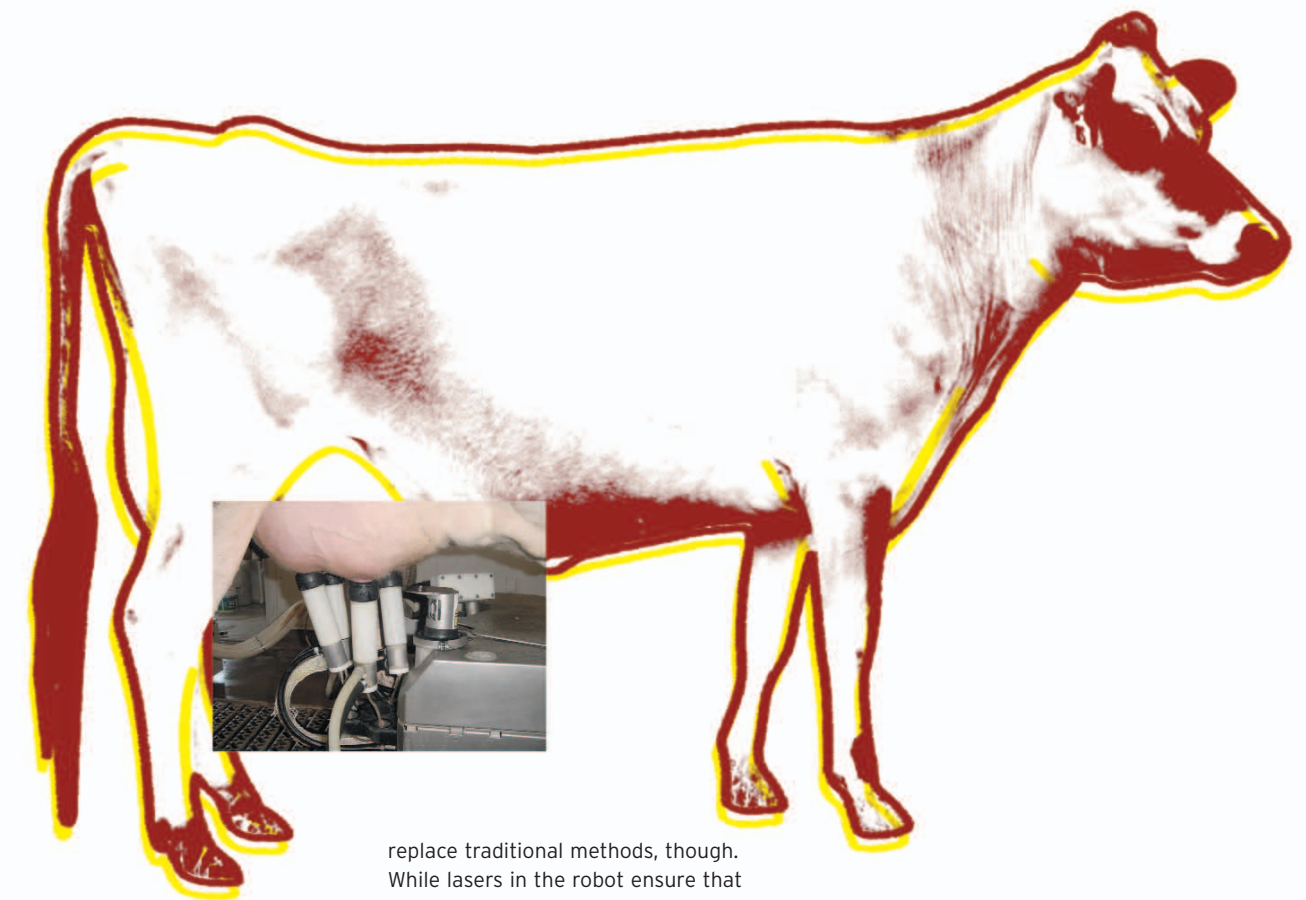
The government funded research into fully automated robotic milking with the joint objectives of improving animal welfare and increasing the milk yield. The ideal was a system whereby a cow could present itself for milking whenever it felt ready, and in which the process could be completed from start to finish without any human intervention.

What began in 1986 as a blueprint for improving dairy farming is a commercial reality today. And what makes such systems technologically possible and economically advantageous is computers.

Only one robot is needed for a modest herd of around 80 cows. But the infrastructure supporting it is just as important. Each cow has an electronic tag that identifies it to the system 24 hours a day.

Instead of all the cows being herded together twice a day, a single robot is available for milking around the clock. In practice, though, the cows generally only want to be milked between 6am and 11pm.

When a cow approaches the milking area its tag is scanned and



the computer determines what happens next: automatic gates either allow her to proceed for milking or, if she has been milked recently, route her away from the robot and back out to pasture.

And if the cow needs to be seen by the vet, the machine can simply guide her to a holding area.

If the system detects that a cow has failed to present herself for milking, a text message alert is sent to the farmer's mobile phone.

Every cow has a price

Naturally, the cows have to be trained to use the system. This is achieved through good old-fashioned bribery: rewarding milking with a portion of concentrated feed.

With this recompense, you might imagine the cow would try to present herself for milking as often as possible. But monitoring of the cow's health means she won't end up over-compensated for her efforts.

The amount of feed allowed is determined by a cow's weight and health and can be varied for each visit. Robotic milking can't completely

replace traditional methods, though. While lasers in the robot ensure that the machinery is placed on the udder, not all cows have teats suitable for machine milking. Typically 10 percent of a herd will have to be sent elsewhere to be milked by hand.

After it has calved each year, a cow will produce milk for about 300 days. More milk is produced in the weeks immediately after birth, with the yield then reducing throughout the year. Armed with this information, the computer allows recently-calved cows to access the robot more frequently than those who are longer in to the milk production cycle.

Robotic systems conform to legislation by removing the first streams of milk, known as foremilk. They exclude this from processing because it's more likely to contain high bacterial concentrations.

The latest machines have sensors that can detect miniscule concentrations of disease and bacteria, and even measure the cow's temperate to monitor its wellbeing.

Farmers' fillip

The economic advantages are obvious: the herd can be milked more than twice a day without a dairy worker needing to be in attendance, while the herd's milk yield typically

increases by 10 percent. Where strict milk quotas are in place, fewer cows are needed.

But dairy farmers are not all rushing out and buying these new machines. A fully automated system is so expensive it is only normally considered if the existing milking parlour is coming to the end of its operational life and needs to be replaced, or the farmer is going to increase production.

The only down side for the farmer is when something goes wrong and milking is suspended until an engineer arrives. For the rest of the time early morning milkings become a thing of the past and the farmer can spend more time with his or her family. Even the notion of part-time dairy farmers is becoming a reality. ☒

> Benefits of robotic milking

- No more cows standing for long periods in collecting yards
- Increased milk yields
- Improved quality of milk
- Better monitoring of the health of the herd
- Improved lifestyle for the farmer