

Time for Technology

Robotic milking gets more affordable every year

Jack Rodenburg, DairyLogix



With quota in very short supply, Ontario dairy producers looking to improve their bottom line will need to focus on investing in greater efficiency at close to their existing herd size. When the real cost of hired labour, and an appropriate value for unpaid family help is included, labour is the largest expense item on the dairy farm, so investing in labour saving automation may be the best way to improve your bottom line in the dairy industry in the next few years. Milking represents about 40% of the daily labour on the dairy farm, and tackling the biggest piece of the biggest cost item suggests that taking another look at the economics of robotic milking may be worthwhile.

Over the last decade, I have made this calculation a number of times for presentations made to various farm groups. While coming up with hard numbers, applicable to specific situations is impossible, one thing is clear, and that is that robotic milking becomes more affordable every year. Robotic milking saves labour, and based on surveys done by the Progressive Dairy Operators group (PDO), dairy farm labour is going up in cost. In 2004 the average wage for dairy farm workers described as “milkers” was \$12.65 per hour. By 2007 this had gone up 7% to \$13.55. Earlier this year 117 herds reported an average wage of \$14.21 per hour for milkers, up 5% again plus an additional \$0.28 in non monetary benefits. So in the last 6 years the benefit of owning a robotic milking system has increased by roughly 12%.

The main cost of robotic milking is the capital invested in the technology. Going back the same 6 years, the prices I used for new robots in 2004 were \$250,000 for the first one and \$200,000 for each additional milking stall. Today the technology is both better and cheaper. The average price quoted for a basic installation by the two major robotic milking companies today is roughly \$220,000, \$390,000, \$735,000 and \$1,400,000 for 1, 2, 4 and 8 milking stalls. So while labour is up 12 % in 6 years, these prices are down 12 to 15%. I also surveyed local dealers for rough prices of parlors with comparable automation. The price of a 2 x 12 rapid exit parlor with a crowd gate, detachers, ID, pedometry and electrical conductivity, quoted to me at \$295,000 is actually up about \$15,000 over quotes I used 6 years ago. Major capital investment usually involves borrowed money, so interest rates are also a factor and they have never been lower than in the last few years.

Given these new economic benchmarks, herds that may not have considered robotic milking economical 5 or 6 years ago, may want to take another look today. Of course the bottom line will be highly dependent on specific circumstances. The decision to replace a worn out parlor with either a new one with robots is quite different from the decision to replace a perfectly good parlor, and what are your expectations in terms of automation and collecting management information? The kind of parlor that offers similar management information as robotic milking will cost a lot of money. Smaller, cheaper parlors with minimal automation will cost much less. Based on my dealer survey, swing parlors and 2 x 8 parlors with detachers and little else can be installed for about \$125,000 but these offer no data on production, heat detection, or mastitis monitoring. So while this may be a practical option, no real economic comparison with robots is possible because one just milks cows while the other provides a management system. And what is your real cost of labour? A dairy family with 2 or 3 high school aged boys that work for room and board will see this completely differently than a dairy that is paying several "arms length" employees by the hour.

In the calculation below, three equipment options are compared in terms of the estimated cost of labour and ownership. The systems being compared are a fully automated 2 x 12 parlor, a low cost 2 x 8 or swing parlor with minimal automation, and a robotic milking system. The following assumptions have been made to compare the economics of a new investment in one of these three options:

Interest rate – arbitrarily set at 4.5% fixed rate with the investment repaid over 12 Years.

Capital cost – \$295,000 for the automated 2 x 12, \$125,000 for the simple 2 x 8 or swing, and \$220,000, \$390,000, \$735,000 and \$1,400,000 for 1, 2, 4 or 8 robots. All prices are installed and exclude milk storage. Building space for a modern parlor milking system is substantially greater than for robotic milking because both the parlor itself and the holding area require more space. The 2 x 12 is allocated an area of 43 x 80 feet, the 2 x 8, 43 x 60 feet and the robots are assigned an area of 12 x 32 feet per robot. This building space is included at \$25 per square foot.

Labour cost – The value of labour used is the \$14.21 per hour plus \$0.28 in benefits reported by the farms surveyed last January. CPP, EI and Workman's Comp. paid by the farmer adds 10% to this number bringing it to \$15.94.

Labour required for milking – In 2004, the Large Herd Operators, conducted a survey of 115 parlor milked herds. On average the double 12 herds reported a throughput of 91 cows per hour with 1.2 people in the pit, which calculates to 76 cows per person hour of labour. The numbers for a 2 x 8 were 62 cows per hour, 1.2 operators and 56 cows per person hour. Set up including bringing the cows up, and clean up, including washing the holding area took 52 minutes per milking in a 2 x 12 and 48 minutes in a 2 x 8. The parlor milked examples below are

milked twice per day. For robotic milking a 2002 survey of herds with 1 and 2 robots indicated the total time for fetching cows, supervised milking of problem cows and cleaning and daily robot care was 1 minute per cow per day. An informal survey done last year suggests this is much too high for current technology, especially in bigger herds. The estimate used here is 1 minute per cow with 1 robot, 0.8 minutes with two, 0.65 with 4 and 0.5 with 8.

Other inputs – Hydro, water, soap, and maintenance all cost money regardless of how the milking is done. But the differences tend to be quite small and they have been ignored here in the interest of simplicity.

Other output variables – Best estimates for robotic milking predict 3 to 5% more milk than 2x parlor milking, but in this example there is no additional income added.

Table 1 below shows daily labour required for milking 60, 120, 240 and 480 cows with each of the three milking systems. As shown robotic milking always saves labour. Hence if future labour costs continue to rise robotic milking will look better and better. Table 2 shows the capital investment in each of the systems. Parlor milking demands enough capital investment to keep one worker busy, either in an automated big parlor like the 2 x12 or a basic smaller parlor like this 2 x 8, and the capital investment is the same regardless of herd size. This makes parlor milking an expensive option for smaller herds where it is only used a few hours a day. Conversely robotic milking requires more equipment with each increase in herd size, and that makes it harder to compete in bigger herds. Table 3 combines the cost of repayment of the capital investment and the cost of labour for the three systems. As shown, using these assumptions, robotic milking is more economical than parlor options at 60 and 120 cows, and remains competitive at 240 cows. In the 480 cow herd more efficient use of the parlor makes robotic milking a more expensive option.

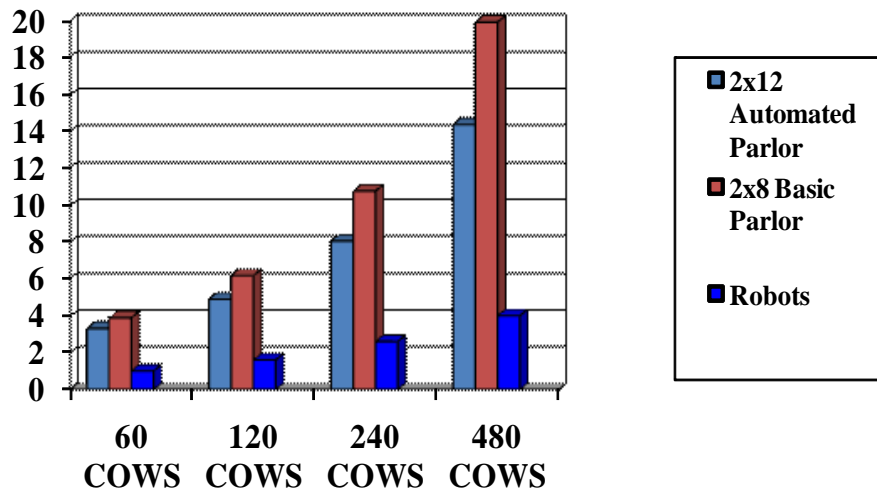


Table 1. Estimated hours of daily milking labour with three different milking systems at four herd sizes.

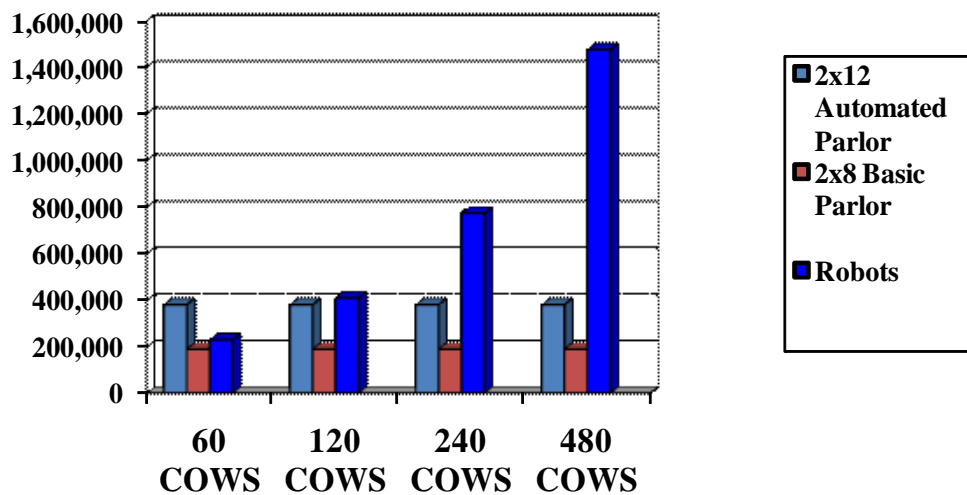


Table 2. Estimated capital investment in equipment and building space for three different milking systems at 4 different herd sizes.

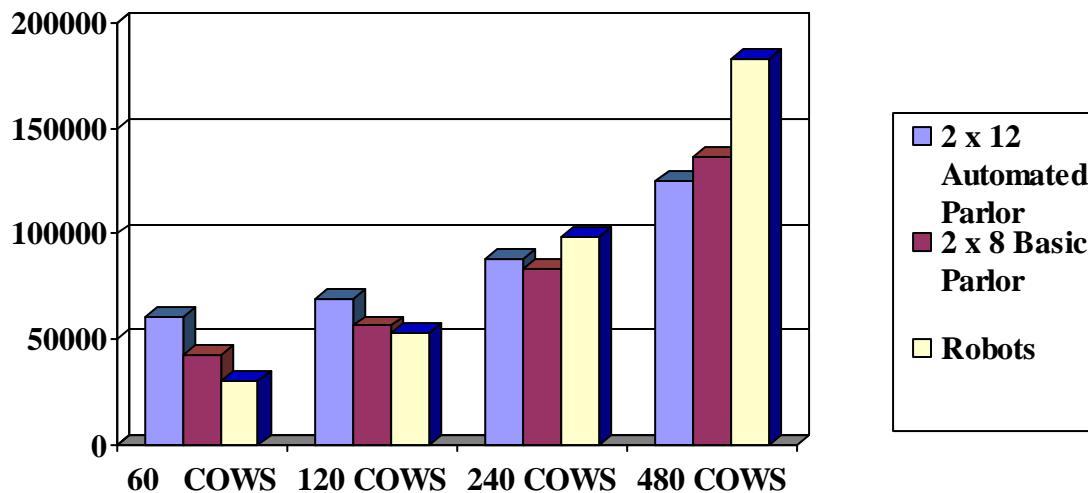


Table 3. Estimated combined annual cost of ownership and labour for three milking systems at four herd sizes using current labour costs.

But when I show this data to owners of larger robotic herds they are quick to point out that hired labour valued over the life of a piece of equipment always costs more than what we estimate. They argue that only 90 percent of a workers time is productive in the first place when you account for breaks, sick days, and training time. And if this equipment lasts 12 years and wages increases continue at current rates, labour will cost 24% more by the end of the life of the equipment. They then add 5% overhead cost per hour because employees require supervision and book keeping etc. They say the real cost of a 2010 model \$15.94 per hour employee is \$18.41 per productive hour of labour today, and by 2022 it will be \$22.83 per hour. Table 4 uses this rate of pay to calculate milking costs and as illustrated using lower labour productivity and inflated wages, by the end of the 12 year period even larger herds may profit from choosing robotic milking.

Of course other variables will also come into play. Cost of a full service contract at roughly \$9000 per robot per year may be more than parlor maintenance in the first 6 years, but likely less in the second 6. Cost of filters, and rubber at about \$1200 per robot per year is less than for most parlors, and water and hydro use may be more or less depending on the specific equipment. As a bottom line, economic evaluation of technology is always highly specific to the individual application, but where robotic milking is concerned, it is clear that the numbers are starting to look better every year.

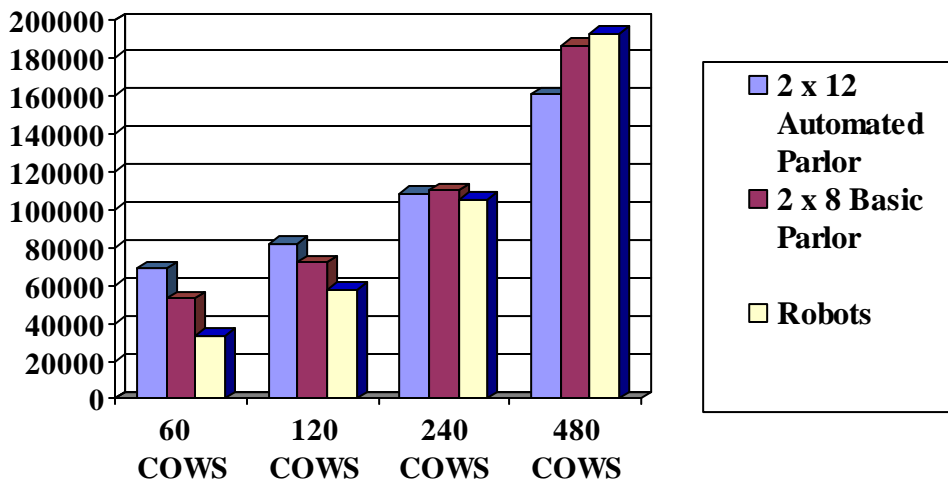


Table 4 . Estimated combined annual cost of ownership and labour for three milking systems at four herd sizes using 24% inflated labour costs and 10% reduced labour productivity.