Milking Systems, Selection, Cost and Implications

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Selecting the right milking parlor is a complex task. Current technology and automation make it possible for one man to milk 130 cows per hour in a fully automated large pit parlor or internal rotary. This maximizes the efficient use of labour. But in a 200 cow dairy herd, this building and equipment, representing a capital investment of $400,000 or more, would stand idle 80% of the time. Excessive capital investment makes the large parlor an unprofitable choice for this size of herd.

There are four main factors that influence parlor selection as follows:

Number Of Cows To Be Milked

Of course larger parlors will be needed to milk larger herds. In a 2007 survey of Ontario freestall herds, the actual reported throughput of pit parlors was 46, 61, 72, and 97 cows for double 6, 8,10 and 12 parlors respectively. Most farms had only one milker in the pit, in the bigger parlors, when a second worker was added, throughput increased by only 10 to 12 cows per hour, so it is not economical to milk with more than one person.

Since one operator per shift, milking 100 cows per hour can milk 700 cows 3 times per day, there are less than a dozen farms in Canada that can justify more than one person in a parlor or a parlor bigger than about 2 x 14.

Labour Available For Milking

While very small parlors reduce capital investment, long milking times are not practical on smaller herds because if a single operator has to milk and perform other chores as well, milking should not take more than 2 or 3 hours per day. hence even small herds end up with 2 x8 and 2 x 10 parlors to allow time for other work. These are the herds that would get maximum economic benefit from robotic milking.

Ability To Address Future Needs

The parlor you choose today, especially if it involves a major investment, will be with you for approximately the next 15 to 20 years. Traditionally dairy herds have expanded by about 3% per year, and a bigger herd in future could justify investing in a bigger parlor. If production per cow continues to increase milking time per cow will also increase making it possible for one operator to handle more units. But if the future includes a switch to 3x faster throughput will mean less units per operator combined with an estimated 355 increase in total milking time.

Buying now for an unknown future may not always be wise. If you expect significant expansion of the herd in the next five years, meet this need in the parlor you build today. Carrying the added cost for a

few years will be less than the cost of updating later. But If you are making a major investment in new equipment, make sure the building, as well as the pit and stabling within the building is in the right place for future needs, and easy to expand. As a rule it is recommended that number of cows housed as a group should be no more than what the parlor can milk in 1 hour (2x) or 45 minutes (3x). Group size should also be a whole number when divided by the number of stalls in a side of the parlor. The common perception that you can build a 2 x 8 parlor now and leave room to expand it to 2 x 12 later is flawed because , even if the present parlor is only a 2x8, provisions for a holding area suitable for a double 12 must be made now, and group size in the barn should be increased as well when the parlor is expanded. Despite higher cost, locating the milk house and utility area to the side of the parlor permits large windows and a well lit work area. This also facilitates later extension of the milking parlor building. One common approach is to build a building for a 2x12 parallel and only install 8 units now, however, this may be false economy. Frequently the stabling, pipeline, concrete work and cabinetry is required to keep the area clean, and direct cow traffic. In many cases an extra $10,000 or $15000 is all that is needed to complete the job and increase throughput by a third.

If further expansion is not in the immediate future the simplest way to ensure flexibility may be to keep the investment to an absolute minimum. A standard exit herringbone or New Zealand swing parlors can often be set up at less than half of new cost by using used stabling, and milking equipment. In addition to the economic benefits of keeping capital investment low, this has the added advantage of deferring the commitment to any one type of technology. In six or seven years when an upgrade becomes important, the technology of the day could be robots, rotaries, or railroad trains.

A “middle road” using moderate cost technology may also be applicable. One large cost item for bigger parlors is the holding area, described earlier. At $25 per square foot for building space in the parlor complex, a holding area and associated return lanes adds nearly $40,000 to the cost of the parlor building. For herds that do not intend to expand beyond 150-200 cows, locating a low cost parlor (perhaps a swing or small herringbone) in a corner of the barn is quite economical. A crowd gate in the alley closest to the outside wall of the barn can be used to define a long narrow holding pen. Cows can be chased out of the free stalls as the crowd gate approaches by electrified chains ahead of the gate over the free stalls. An alternative method is a hinged bar that flips back from the head rail to the rear of the partition to lock cows out of the stalls. While this parlor location is economical for a smaller freestall herd, keep in mind that the parlor, milk house and utility are expensive to move. The commitment to this location is definitely long term and less than ideal if you do expand in the future.

Personal Preference For A Specific Type Of Parlor

There are many different styles of milking parlors on the market, each with advantages and disadvantages. Low end options such as swing parlors can be very economical but the narrow pit, and swing over hoses are not a pleasant place to work. Milking between the back legs in these parlors and in parallels makes it difficult to adjust the milker claw properly on some cows especially those with high fore udders. Although milking in a parallel is probably safer most operators prefer the higher visibility of the udder in herringbone layouts. Pit depth and fatigue associated with working at a fixed height is also less of an issue in herringbones. For the author, pit parlors remain the logical option for herds up to 700 cows. tandem parlors have limited efficiency because of walking distances and without a clear routine, milking procedures often break down. Internal rotaries with one operator are very efficient, but the

reluctance of cows to get on and their eagerness to get off suggest that this is not a system cows prefer. external rotaries are probably ideal in terms of cow comfort, but the fact that these parlors require at least 3 people around the platform make labour organization too complicated on all but very large dairies.

Economics of Parlors vs Robotic Milking

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 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 x8 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.

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

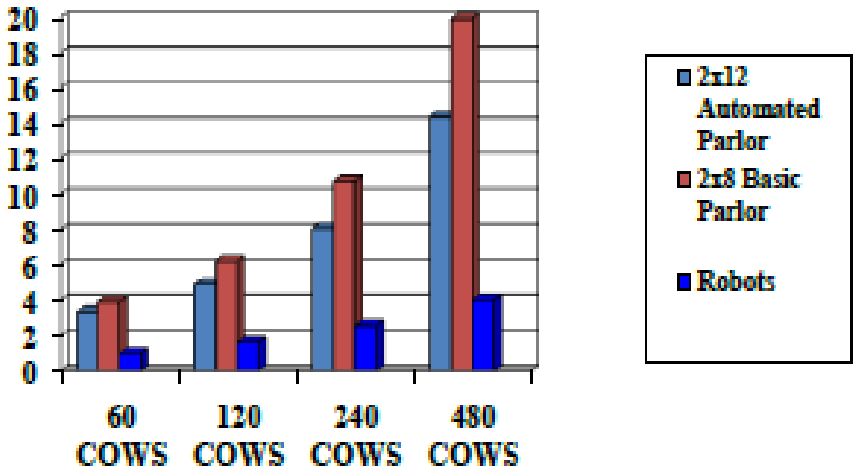

Table 1. Estimated hours of daily milking labour with three different milking systems at four herd sizes.

individual application, but where robotic milking is concerned, it is clear that the numbers are starting to look better every year.

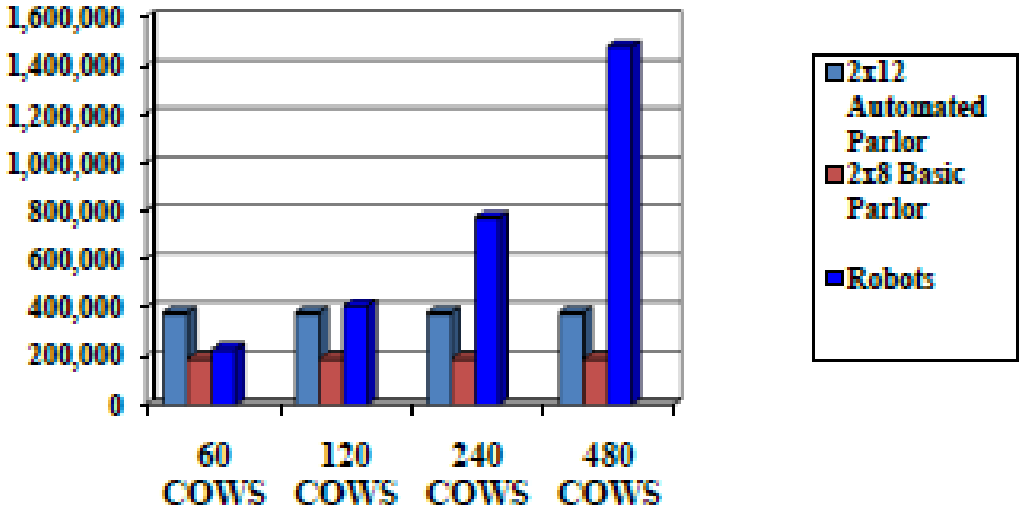

Table 2. Estimated capital investment in equipment and building space for three different milking systems at 4 different herd sizes.

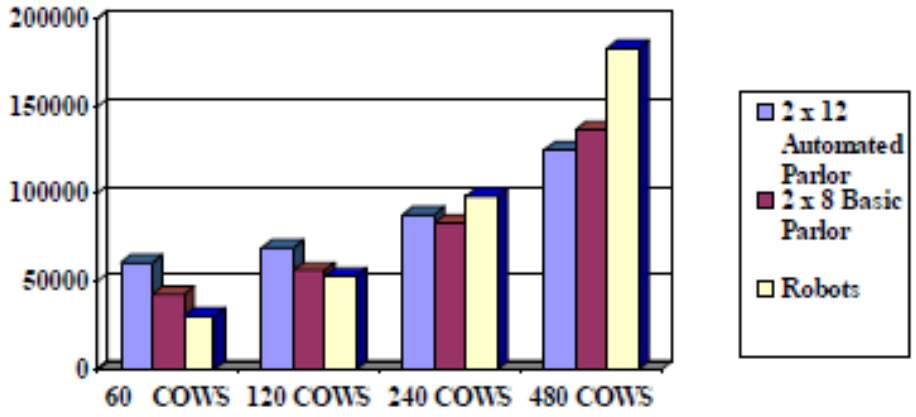

Table 3. Estimated combined annual cost of ownership and labour for three milking systems at four herd sizes using current labour costs.

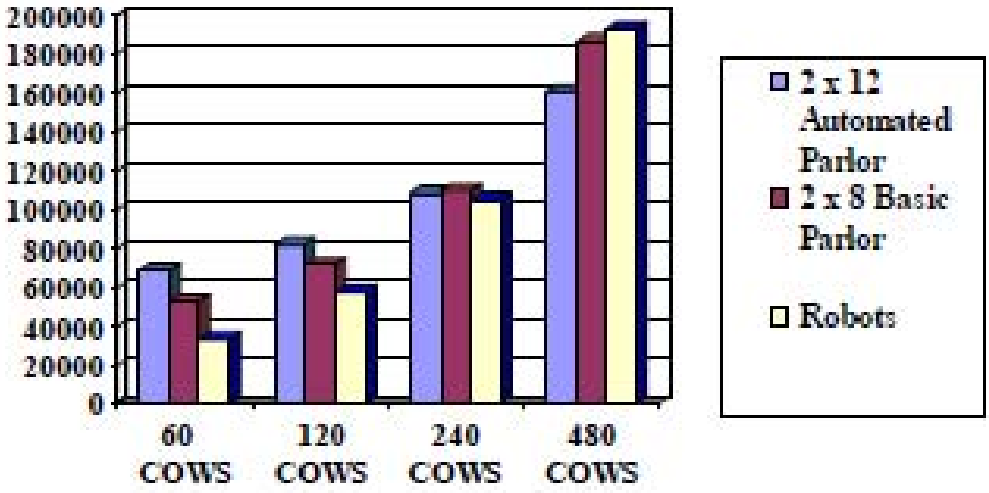

Table 4 . Estimated combined annual cost of ownership and labour for three milking systems at four herd sizes using 24% inflated labour costs and 10% reduced labour productivity.