

Milking Center Options

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Milking can make up over ½ of the labor expended on a dairy farm. Labor efficiency for milking can range from 20 to over 100 cows milked/person/hour. The milking facilities can make up 20 to 60 percent of the total capital investment in a dairy. The combined annual cost of typical Midwestern milking facilities and the labor to operate them can range from 5 to 30 percent of the cost of producing milk. Proper planning, construction, and operation of the milking facilities can thus have a significant influence on the profitability of a dairy enterprise. The following table gives some estimates of the annual cost of milking facilities and labor for different milking systems.

<i>Milking System</i>	<i>Low</i>	<i>Typical</i>	<i>High</i>
Round-the-Barn Pipeline 30- 100 cows	\$1.15/cwt.	\$1.50/cwt.	\$2.25/cwt.
Flatbarn Parlor 50 - 150 cows	\$1.10/cwt.	\$1.20/cwt.	\$2.80/cwt.
Elevated Parlor 300 cows	\$0.85/cwt.	\$2.00/cwt.	\$3.50/cwt.
Elevated Parlor 600 cows	\$0.75/cwt.	\$1.80/cwt.	\$2.50/cwt.

Assumes \$10/hr labor cost, 20,000 Lb./milk/cow/year

While it is possible to reduce the cost of production and increase profitability of a dairy operation by investing in milking facilities it is also possible to increase the cost of harvesting milk and reduce profitability. The situation with the greatest risk is the herd expanding to 300 cows and building an elevated parlor. Close attention must be paid to the level of capital investment to ensure these operations remain profitable while expanding.

Dairying is a risky business. The rate of return is typically low compared with the level of capital investment required. Profitable dairying requires highly specialized knowledge in a large number of different subject areas. These are some of the reasons that dairy farms have continued to be family-owned businesses rather than investor-owned or corporate enterprises. Increasing the debt load increases the risks associated with a dairy enterprise. Reducing debt and financial risk will give the dairy owner/operator more management options for dealing with other risks such as volatile milk price, bad weather, poor feed quality and disease. This paper will present options for milking facilities to maximize profitability for expanding dairy operations in the Midwest and keep them competitive with dairy producers in other parts of the country and world.

Level of Capital Investment

It is instructive to compare the relative investment in different types of milking facilities over a range of herd sizes as a measure of the efficiency of capital investment. A useful rule of thumb to compare the level of capital investment is the ratio of the initial cost of milking facilities to the gross annual milk sales. This ratio is typically Less than 20 % for large western herds.

Example: 1000 cow Western dairy
\$2,400,000 Gross annual milk sales
\$480,000 Total Milking Center Cost (Double 20)
Ratio of milking center cost to gross milk sales = 20%

A typical scenario for a multifamily, expanding midwestern dairy would be as follows:

Example: 300 cow midwestern dairy
\$720,000 Gross annual milk sales
Ratio of milking center cost to gross milk sales = 20%
\$144,000 Total Milking Center Cost

A single-family operation would typically have fewer cows and the following scenario:

Example: 100 cow midwestern dairy
\$240,000 / year Gross milk Sales
Ratio of milking center cost to gross milk sales = 20%
\$48,000 Total Milking Center Cost

These simple examples help to approximate the level of capital investment in milking facilities to keep midwestern herds competitive with large herds in other parts of the country. Further details on the type of milking facilities that can be constructed for these budgets are presented below.

Flatbarn Parlors

Flatbarn parlors are best used on 50 to 150-cow herds as a transitional facility while building cow numbers and reducing debt. Flatbarn parlors are well suited for installation in existing stall barns. A recent study (Chastain and Reinemann, 1995) showed the total project cost of flatbarn parlor conversions ranged from \$6,000 to over \$60,000. The average throughput of 13 flatbarn parlors was 45 cows per hour with a single operator. There was little difference in cows milked per hour between back-out and walk-through stalls. The best labor efficiency was achieved with one person milking and single cow movement rather than moving cows in strings.

The total project cost should be kept below \$10,000 to \$20,000 to make these facilities competitive with other milking systems. This will require use of an existing milking system and no major structural modifications to the old barn. Most flatbarn parlors use automatic detachers, although a number of producers have achieved excellent labor efficiency using only end-of-milking indicators. The key to efficient milking in a flatbarn parlor is efficient cow flow with one person operation. If the initial cost of a flatbarn parlor is kept under control, it is an effective way to improve profitability and reduce financial risk during gradual herd growth.

Milking Parlor Labor Efficiency

It is clear from numerous time and efficiency studies that the largest single variable in the success of the milking operation is the care the operators exercise in performing their function. The efficiency of labor in milking parlors covers a very wide range from under 50 to over 100 cows/person/hour. The biggest single factor in determining the number of cows milked per hour is the time taken to prep cows and attach milking units. The desired milking routine and capabilities of the labor should be determined before selecting parlor type and size. The entire milking routine must be performed in the time it takes to milk a cow in order for the operator to “keep up” with the parlor. The following table gives the average machine-on-time for varying

levels of production and milking frequency. These numbers include 30 seconds for an automatic detacher to operate.

Herd Average	2x Milking	3x Milking
15,000 lb.	5.5 min	****
23,000 lb.	8.0 min	5.5 min
30,000 lb.	10.5 min	7.0 min

It may take from 2 to 10 minutes to release one group of cows from the parlor and load another group for milking. Subtract the cow movement time from the machine-on time to estimate the time available for post dipping before release, and prepping cows and attaching units. A more detailed analysis of expected labor efficiency and annual cost of milking facilities can be performed with the Milking Center Advisor software available from the University of Wisconsin Center for Dairy Profitability world-wide-web site (<http://www.wisc.edu/dairy-profit>).

Typical milking rates are shown in figure 1 for scenarios with and without recommended preparation procedures. The differential labor cost to milk 300 cows 3 times per day with prepping (75 cows/person/hour) versus no prep (90 cows/person/hour) equates to a milk income of 200 lb./cow/yr. If the extra time taken to prep cows will yield more than 200 lb./cow/year it is a wise economic decision to prep cows.

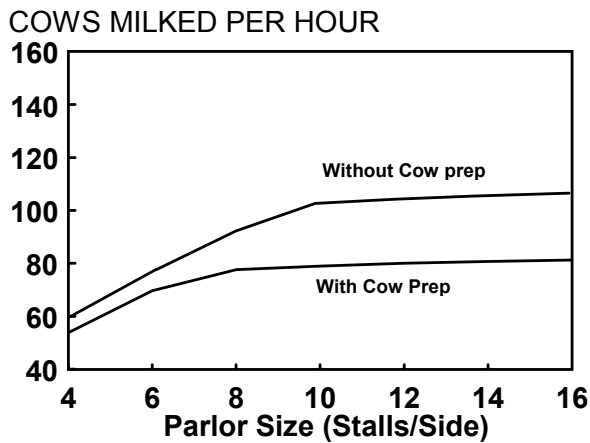


Figure 1. Cows milked/hr. one operator

Some of the options available for milking facilities will improve labor efficiency (cows milked/person/hour). The annual cost of these options versus the labor savings is the first test of whether to invest in them. In the scenario presented in figure 1 the investment in a parlor larger than a double 8 produces little or no increase in labor efficiency if cow prep is practiced, and therefore is not a good use of capital.

There are other milking facility options that have no effect on labor efficiency (cows milked/person/hour) but may improve the work environment. It is helpful to frame these decisions as a balance between the increased annual costs of these amenities versus the

reduced annual wage paid to the operator. As the key to success of any milking facility is the quality of the operator, the improved cash flow situation resulting from reasonably priced milking facilities may be best used to increase the wage of the owner/operator or other qualified labor.

Elevated Parlors: 100 to 400 cow herds

If it is anticipated that the size of the milking herd will be in excess of 100 cows, plans should be made to build an elevated parlor as soon as cash flow allows. In order to keep from going broke it is important to keep the level of capital investment in line with the income stream from

the herd. A “low cost” milking parlor can be built for under \$100,000. Until the parlor is operated 24 hours per day, the fundamental goal for profitability is to keep the capital cost of the parlor low. When the herd size has grown to the size that round-the-clock milking is practiced, the goal for profitability shifts to increasing the number of cows milked per hour to allow further herd expansion. This shift in objective and economics usually occurs at a herd size between 400 and 700 cows.

In order to keep capital investment in line with cash flow and still allow for future expansion it is generally most practical to build a new building for the elevated parlor rather than retrofit an existing building. It is important to build the milking facility in a location that will be well integrated with future cow housing and will also allow for future expansion of the milking facility. Some design concepts for the expandable ‘Wisconsin Idea Parlor’ to keep expanding Midwestern dairies profitable are presented in the attached figures.

Elevated Parlors: 600 cow and larger herds

Two possible options exist when milking facilities operated by one person reach the limit of their capacity (operated 24 hours per day) and further herd expansion is desired:

- 1) Build a larger parlor and add a second operator,
- 2) Build two one-person parlors at the current site, or
- 3) Develop a second site with a new one-person parlor and animal housing.

Serious consideration should be given to developing two sites, each with their own milking facilities, animal housing, manure storage and feed storage. Several factors indicate that two sites are better than one.

- The majority of the economies of scale of facilities are achieved at cow numbers of 400 - 600.
- Labor efficiency will always be better with two one-person parlors compared with one two-person parlor.
- A recent study by Thomas et al (1995) showed that two small parlors were considerably more efficient and profitable over 15 years of operation than one large parlor.
- The environmental risks and regulations associated with two smaller versus one large facility are considerably reduced.
- The cost and complexity of applying manure to the land are reduced if the manure storage can be located in the center of the land area to which it will be applied. Hauling distance and cost for forage can also be reduced.
- Risks associated with transmission of disease are reduced with two smaller facilities.
- Two ideal building sites may be easier to locate than one large site

Milking Parlor Design Considerations

A milking parlor building should be designed around the milking system. Milking systems have specific requirements regarding the slope of pipelines and the physical relationships between animals and machines. Other physical relationships, while not absolutely required, greatly improve the performance of the milking system. Placement of a milking system in a building not designed specifically for it can result in reduced milking and cleaning performance.

Several requirements of the milking system influence building design. The most important of these is the slope of the milklines. Increasing milkline slope greatly increases the carrying capacity of milklines. Pipeline length and slope, position of the receiver, and mounting requirements of ancillary equipment such as milk meters, weigh

jars, and pulsators, determine the required clearances. All pipelines in the milking system must be sloped to a drain point. The slope of the other piping systems generally conforms to that of the milklines. The slope requirement for pipelines can cause clearance problems especially if the cow platform and parlor pit floor slope in the opposite direction as the milkline. Consideration of slopes and clearances is especially important if a parlor to be expanded at a later date. The milking system should be designed before the parlor, milk room, and utility room so the building will not place limitations on the milking system design.

Efficient and effective CIP system designs require pipe lengths and number of fittings be kept to a minimum. This will reduce the installation and operational cost of the CIP system as well as improve both milking and cleaning performance. The receiver should be located to minimize the number of bends and fittings in the milkline and should not interfere with operator movement during milking. Receivers are most commonly installed in the operator area, in breezeways, or in the milk room. The wash sink is generally located near the bulk tank inlet to facilitate the piping switch from the milking to cleaning configurations. The length of piping from the milk room to the parlor should be kept to a minimum to reduce cleaning water volume, heat loss during cleaning, and difficulty controlling circulation. The utility room should be located to minimize the length and number of fittings in the main airline connecting the vacuum pump(s) with the distribution tank and/or sanitary trap.

References

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- Kammel, D.W., 1995. Swing Parlors. Designing a Modern Milking Center, Northeast Regional Agricultural Engineering Service National Conference, Rochester New York, Nov 29 - Dec. 1, 1995