

MILKING FACILITIES FOR THE EXPANDING DAIRY

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Milking Parlor Planning

The main reason for investing in a milking parlor is to increase labor efficiency. Milking is the largest single use of labor on a dairy. Increasing the number of cows milked per person hour will increase the profitability of the operation. Other motivating factors include; improved working conditions, increased uniformity and quality of milking, and attracting and keeping hired or family labor. These benefits must be weighed against the capital cost of the parlor. A combination of these and other factors unique to each dairy will influence the final decision as to the type and size of parlor to be built. This paper will provide some information regarding the relative costs of capital versus labor as an aid in the parlor selection process.

The two most important inputs to the parlor selection process are the herd size and the labor situation. Neither of these factors is likely to remain constant over time on a typical dairy. A well built parlor will have a useful life of 15 to 20 years or more. Parlor planning should consider probable herd size and labor availability for at least 20 years. The long range plan may influence the location and layout of the parlor built today. Facilities which have possibilities for modernization or expansion have far greater value than those without such options.

The herd size and desired time spent milking will determine the required parlor throughput. The time available for milking is highly dependent on the labor situation of the dairy. Important questions concerning the labor situation are:

- o How many owner/manager/operators are there?
- o Will one or more owner/manager/operator also milk cows?
- o What family labor will be available?
- o Will labor be hired?
- o What is the cost of hiring and keeping good labor?
(family or otherwise)
- o How will the labor situation change over 20 years?

On Midwestern dairies the owner/operator typically does all or part of the milking. This becomes less feasible as the herd size increases. The return on time invested managing a large dairy will be higher than for time spent milking. The herd must be milked quickly if the manager is the milker. More time can be devoted to milking with hired milkers. The importance of milking procedures in maintaining milk yield and quality should not be under-estimated. Money spent to hire and retain a conscientious milker is money well spent.

Layout and Design

The parlor makes up only a small portion of the milking center. The milking center should include a holding area, return lanes, animal retention area, milk and utility rooms, and an office. The design of the milking center must be such that its various components function well together. The milking center must also be integrated into the total dairy facility. This is necessary to realize the full benefit of the investment in each component.

The parlor planning process must take into consideration the investment capabilities of the dairy. The parlor should be part of a long term expansion and investment plan. There are ways of spreading the cost of the parlor over time if the initial cost is a major obstacle. This requires forethought and planning to result in a workable transition and desirable end product. Additional stalls can be added to a previously built parlor if the initial construction was properly planned. This option may be impossible or prohibitively expensive if planning was not done.

A primary reason for investing in a parlor is increased throughput. The investment will not achieve its potential benefit if planning and management on the entire dairy are lacking.

Who Is the Master Planner?

In many cases, the person responsible for the big picture is not clearly designated. The dairy operator takes the final responsibility for what gets built. His/her decisions are based on information from a number of sources primarily the milking equipment dealer and the building contractor. Critical components can be neglected in this interchange. A typical example of neglected components are the facilities for rapid cow traffic.

Most major milking equipment companies offer stock plans and design support for planning productive and efficient milking centers. These plans are based on previous facilities which have worked well. It is essential that the building contractor and the milking equipment dealer are in close communication throughout planning and construction. The cost of a competent dairy design consultant will generally be more than recovered in reduced construction and remodeling costs of a large dairy operation.

How Can I Build Now and Plan for the Future?

Expansion plans may call for a milking parlor for which the present capital cost is too large. There are several methods of reducing the initial cost of a milking center and yet allow the parlor to grow with the herd. The milking center building can be built to accommodate the desired parlor size with equipment in only a portion of the stalls. The remaining stalls can be equipped later. Another option is to delay the purchase of automation for the parlor. This will generally require a second person to operate the parlor. The milking center can also be built in manner

which allows for the building to be expanded. This requires careful site planning to allow for space required for a larger milking parlor and holding area (i.e. both ends of the building).

Parlor planning should take into account herd size and labor availability for at least 20 years. The critical economic decision for smaller herds is the size of the parlor and the corresponding capital investment of a milking center. The critical economic decision for larger herds is the number of milkers in the pit.

A single milker may be 'under-employed' (i.e. one milker handle more units) in a small milking parlor. Consider that it costs about \$1.14/hr or \$27 per day to own an extra 2 parlor stalls per side. The extra labor cost for a milker who has 20% idle time is about \$13 per day.

An advantage of starting with a smaller parlor is that both milkers and cows will take time to learn the system. The quality of milking is likely to be better if the new milker has fewer units to operate. This will result in better herd health and milk quality, increased milk production and increased profitability.

The disadvantage of starting with a smaller parlor and then expanding is the difficulties associated with remodeling old facilities. This disadvantage can be minimized if the facility is built with future expansion in mind. A reasonable compromise must be struck between matching the parlor to the herd and the number of times the milking center is remodeled. Given probable future trends in herd size it would be unwise to build any dairy facility without allowing for the option of expansion.

Parlor sizing analysis: The Milking Center Advisor (UW Extension bulletin # A3574, cost \$6.00 plus postage) was developed to help answer cost versus benefit questions. It is available from your local Extension office or from Extension Publications Room 245 30 N Murray Street, Madison WI, 53715, (608) 262-3346. The software is a Lotus 123 template which provides estimates of time required to milk varying herd sizes and the cost of construction for various parlor sizes. The capital and labor costs are then combined to determine the annual cost of milking the herd. State-of-the-art double sided herringbone or parallel parlors are considered. These make up the largest share of new parlors being installed. The cost and throughput versus size trends will apply to other parlor types, although exact figures may vary. Some of the main conclusions drawn from analysis with this software and other parlor studies follow:

Parlor throughput: There is a significant range of throughput for parlors of the same size. The range increases with parlor size. Some of the difference in throughput is related to the degree of automation and cost of the milking center. A greater part of the difference is due to the design and management of the milking center and dairy as a whole.

Automatic detachers with end of milking sensors are a major factor in increasing parlor throughput. They are considered standard equipment in new parlor installations. The number of

units that a single milker can handle increases significantly with automatic detachers. They also promote uniformity of milking particularly if there are several milkers. Vacuum is released and then units are removed consistently at the end of milking. The use of automatic detachers reduces the milkers time spent deciding when milking is finished.

The **time to wash and prepare cows and attach units** has a major influence on milking rate. There is a wide variation in the time taken to perform this task among dairies. The time spent washing and prepping has a direct influence on udder health and milk quality. In hot, dry climates wash pens remove major debris from the udder. Cows then air-dry before entering the parlor. Dry resting areas also reduce dirt and manure adhering to udders. Wash pens have not been widely used in cold, damp climates. Air drying is not feasible when temperature is low and/or relative humidity is high. It is also more difficult to maintain clean and dry housing under these conditions.

The time required to attach a unit can be as low as 5 seconds. If teats are manually washed and dried the minimum time spend on relatively clean cows will be 20 seconds. This can be as high as 60 seconds if cows entering the parlor are dirty. Note that the use of a pre-milking sanitizing dip does not eliminate the need to remove and visible debris from the teat. The minimum required time for prepping cows is higher in the Midwest than in the west and southwest. Milking rates are therefor expected to be lower. The maintenance of clean and dry freestall housing has a significant impact on parlor milking rate and number of milking units one milker can handle.

Rapid cow traffic is essential for efficiency in the milking parlor. Cow traffic facilities include the holding area, crowd gate, return alleys and animal retention area. These are often neglected in the planning of a milking center. This is particularly true when buildings are remodeled. A properly constructed holding area with automatic crowd gate will cost about as much as two fully equipped milking stalls. The increased throughput resulting from an investment in cow traffic will always be more than for additional milking stalls or increased automation in a parlor with poor cow traffic. The holding pen should not be placed in a barn alley. Provide an easy, well light path for the cows to enter and exit the parlor. The milker should not have to leave the pit to chase cows if cow traffic facilities are working properly.

How many units can I handle? The answer to this commonly asked question depends on how the milking center and dairy as a whole is designed, built and managed. One milker will be fully occupied with 3 units per side in a parlor without automatic takeoffs, manual entrance and exit gates and dirty cows entering the parlor. Adding more units will not result in increased throughput in such a situation. One motivated milker can keep up with 10 or more units per side in a highly automated and well managed milking center. The more time and effort spent to design and build a high quality parlor and manage the total dairy, the more units a milker can handle.

Should I put 1 or 2 operators in the pit? The decision to use 1 or 2 milkers in the parlor has a major impact on the annual labor cost of milking. Adding a second milker in all but the largest parlors sizes increases the total annual milking costs. Labor costs are doubled but throughput are not correspondingly doubled. Adding a second milker to a parlor in which one milker is not fully occupied may show little or no increase in throughput. Another advantage of using 1 milker versus 2 is the ease of scheduling and labor management. This is particularly true if 3 time-a-day milking is adopted.

How long should the milking shift be? Milkers have traditionally performed much or all of the other labor to run Midwestern dairies. This has give rise to the idea that milking must be performed in two hours. Extra labor will become a necessity if the herd size is expected to rise above 100 cows. If numerous workers are employed it is more efficient to specialize responsibilities and tasks. The time to perform those tasks will therefore increases. Milking is a task which lends itself to hired and/or part time help. It is done on a regular schedule throughout the year and requires relatively little training. A 4 to 6 hour milking shift is not unreasonable for a dedicated milker working in an efficient and pleasant work environment.

The length of the milking shift has a dramatic effect on the capital investment for the freestall/parlor system. A shorter milking interval requires a larger parlor for a given herd size. The question which naturally arises is; Can you afford to milk in two hours? The time spent milking rather than the parlor size should increase with the herd size to maintain the lowest cost system. This is indeed the trend on very large dairies which milk around the clock.

Should I increase the size of my tie stall barn? The capital investment per cow for new facilities is lower for a freestall/parlor system than for a tiestall/pipeline system for all herd sizes. The capital costs are less because a freestall barn is a far less costly housing option than a tie stall. This more than offsets the increased cost of a reasonably sized milking center. The difference between the two systems is small for small herds. As the herd size increases the difference in annual costs grows. For herds up to about 50 cows, the choice of whether to milk in a parlor is thus more a matter of preference than economics. For larger herds the freestall/parlor system is a matter of economic necessity. Most of the economy of scale can be achieved, however, at a herd size of about 300 if a reasonably sized parlor is selected.

An investment in a long range plan to change from a tiestall/pipeline system to a freestall/parlor system will have far greater value than an investment in increasing the size of a tiestall/pipeline system. The decision to milk in a parlor is often connected to a number of other management and facility changes on existing dairies. These may include new housing, feeding, feed storage and manure management systems. Careful long range financial and management planning is required to change from one system to another.

Parlor planning summary: The parlor must be integrated into the milking center and the dairy as a whole so that all of the components work efficiently together. Sizing of a milking parlor

should take into account the management level of the dairy. Management decisions may limit the milking rate in a parlor. Building a larger parlor may therefore not result in shorter milking time. The length of the milking shift will have significant bearing on the required milking rate and parlor size. The desire for a short milking shift increases the required parlor size. This extra equipment will, however, stand idle for longer periods. Equipment which is under-utilized for either of these reasons will increase the cost of operating the dairy.

WHAT ABOUT "NEW ZEALAND STYLE" MILKING PARLORS?

Rural Wisconsin is humming with news about New Zealand dairying including parlor styles from down under. What sort of milking parlors do you see in New Zealand? It is probably not surprising that there are many different types. Rotaries were very popular for a while. The current preference seems to be for swing parlors. This is the type commonly referred to as the New Zealand style and being sold in the Midwest under this name. The main feature of these is that the milking units are hung from the milkline over the center of the operators area (formerly referred to as the "pit"). There is a double row of cows like in a standard herringbone or parallel parlor. The units are swung from side to side as groups of cows are moved through the parlor. There is thus one milking unit per two milking stalls. This style of parlor was built in the 60's and 70's in the US although it was common to run a row of weigh jars down the center of the pit at that time.

Milking performance: The milkline is just above the operators head which positions it about 3-4 feet above the udder. The milk lift is therefore about half that of a high line. The change in milking vacuum at the claw over the course of milking will be about half way between that in a low line parlor (most stable) and that in a high line (most change). This level of vacuum change will not adversely affect milking if units are removed promptly at the end of milking (as is the case if automatic detachers are used).

Cows per Person Per Hour: The general rule of thumb is that a double sided parlor (one milking unit per stall) will have about the same throughput a swing parlor with about half again as many stalls e.g., Double 12 (24 stalls) throughput = Swing 18 (36 stalls). This figure appears to apply to parlors which have more than about 16 milking units per worker. For more smaller parlors the difference in throughput is reduced (e.g. a Double 8 with one operator has about the same cows per hour per person as a Swing 8 with one operator).

Low Cost? There are several features of the "New Zealand" parlor which reduce initial cost. 1) Building design. The parlor building will have to be somewhat larger than a double sided parlor with comparable throughput, stall type and cow traffic facilities i.e. inside return lanes. In New Zealand the milking "shed" is usually a concrete platform with a tin roof over it with cows held in an uncovered pen. This building style would not be acceptable to most Wisconsin dairy operators nor to Wisconsin milk inspectors. The attempt has been made to keep the building cost down by minimizing interior walls and using low cost materials and designs. There have been

curtain side walled milking parlors provisionally approved and installed in Wisconsin. Inside return lanes are sometimes eliminated to reduce building size and cost.

2) Simple Stalls: A major cost savings of the New Zealand parlor is the simplicity of the stalls, using lots of straight pipe as opposed to bent shapes, no rapid exit, and no automatic indexing. The stall is most similar to a parallel stall with units attached between the rear legs. The cows do stand at an angle of about 70 degrees from the pit wall (parallel 90 degrees, herringbone = 35 degrees). These type of stalls lend themselves to owner construction which is another cost saving measure commonly employed to reduce parlor cost. A careful evaluation of the design and construction capabilities is essential before embarking on such an adventure.

3) Milking equipment. A common method of reducing initial cost is to make use of existing or used milking equipment. A swing parlor is an excellent location to install a used 2 inch highline system. Such a milkline sloped at 2.5 inches per ten feet will accommodate up to 4 units per slope or a swing 8 parlor. If the initial plans call for a swing parlor, however, it is wise to build the platform and pit so that it can be converted into a double sided lowline parlor in the future. A double-sided, lowline parlor with detachers is a more labor efficient and convenient milking system than a swing parlor.

The savings in the number of units is from 25 to 50 percent. The major equipment aspect contributing to reduced cost is that swing parlors are often operated with no detachers or with inexpensive molded plastic equipment. All major equipment companies offer this type of detacher as well as more expensive stainless steel units. Both types work. Expect shorter life and more frequent repair of plastic units. Starting out with lower cost automation is a way of reducing initial parlor cost regardless of the type of parlor. This leaves open the option for upgrade in the future. Any parlor type can be operated without automatic detachers which will reduce initial cost but increase labor cost. End of milking indicators are highly recommended if automatic detachers are not used.

Size: Many of the concepts to reduce the initial cost of a "New Zealand Style" parlor can be applied to any type of parlor. The biggest factor influencing initial parlor cost is the size. Herds under 300 cows need to be especially concerned about the cost of milking facilities versus the benefits gained in labor efficiency. To stay profitable, small herds should have small parlors. Herds with plans to enlarge should build parlors with options to expand.

AUTOMATED FLATBARN MILKING

Automated flatbarn milking systems or flat parlors have become very popular with expanding herds in the Midwest. They offer a powerful risk reduction strategy in the transition from round the barn pipeline to parlor/freestall operations. I recommend their use in herds with 50 or more cows regardless of expansion plans. They have been shown to dramatically increase labor

efficiency and reduce the physical labor involved with milking. They can also be installed very economically for herds with limited investment potential.

Flatbarn parlors resemble traditional stanchion or tie-stall barns but with permanently mounted milking equipment and fewer milking stalls. In an automated flatbarn parlor the cows move to the milking unit rather than the milking unit moving to the cows. This style of milking system was commonly used in the west and southwest by dairy operators expanding the size of their herds.

Flat-barns are not commonly built as new facilities. An existing stall barn can be renovated to add milking automation and gain labor efficiency. The cost of a stall-barn to flat-barn renovation can be as low as \$1000 per milking unit if existing stalls and milking equipment is used. This cost can be as high as \$4000 per milking unit if major renovation to stall and new milking equipment is required. Care must be taken in the design of these facilities to achieve improved milking labor efficiency over round-the-barn pipeline milking.

When calculating the potential cost saving, the biggest question to ask is what is the value you put on your labor. Automatic detachers and facilities for good cow flow will permit one milker to operate 6 to 8 milking units. When designed and built correctly, an automated flatbarn can increase the number of cows milked per person per hour by 30 to 60 percent over round-the-barn pipeline milking. In a typical Stanchion barn, one person can milk about 25 cows per hour. Recent field data from 13 automated flat parlors in Wisconsin and Minnesota show that the average throughput for flat parlors with 8 milking units was 40 cows per hour with one operator and 55 cows per hour with two operators. Adding the second operator is thus not advantageous economically or a good use of labor.

Pay attention to ease of cow traffic and provide a designated holding area. Cow movement is improved if the holding and milking areas are well light with no corners for cows to turn on entry and exit and waiting cows can see into the milking area from the holding pen. To calculate the minimum size of the holding area multiply the estimated cows milked per hour by 15 to obtain square footage. Filling gutters with concrete will improve ease of moving cows into and out of stalls. Operator ease of movement is also improved.

Automatic detachers should be installed as adding automation is the main advantage of flat barn milking. The detacher/milking unit combination should remain stationary during milking. Move the cows not the equipment. Portable unit detachers designed for use in round-the-barn pipelines systems are well suited for flat-barn applications. The milking units can be removed and cleaned in the milkroom after milking. Permanently mounted detachers and a clean-in-place system may be installed but add considerable expense to the system. Existing pipeline equipment should be used if possible. The milkline diameter and vacuum pump capacity may determine the maximum number of milking units allowable. Equipment installed in a flat-barn may also be used in a future milking parlor. Automatic detachers and facilities for good cow flow will

permit one milker may operate 6 to 8 milking units. A well managed fully automated flat barn can achieve milking rates of 30 to 45 cows per person per hour.