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## **PLANNING MILKING FACILITIES FOR DAIRY EXPANSION**

*J. F. Smith*

### **Summary**

Construction of a new milking center or remodeling existing milking parlors is a very important decision that can dramatically affect the labor efficiency and profitability of a dairy. Dairy producers should set reasonable goals for present and future needs. All options and configurations of the milking center should be considered and evaluated on a 15-yr planning horizon. Milking parlors should be designed to allow use of a full milking hygiene and add flexibility in management of the parlor.

(Key Words: Expansion, Milking Facilities, Construction.)

### **Introduction**

Size of dairy farms is increasing in all regions of the U.S. In two of the largest dairy states, California and Wisconsin, mean herd size has increased 950 and 250%, respectively, since 1950. Dairy herds of 500 cows are common in all areas of the U.S., and herds over 1500 cows are common in the West and Southeast. Many dairy operators are considering expansion of existing facilities or construction of new facilities to increase efficiency or profitability.

In many dairy operations, the maximum herd size is determined by the daily capacity of the milking center or the land available for manure disposal. In many areas of the U.S., a lack of appropriate acreage on which to apply manure nutrients is one of the largest hindrances to dairy herd expansion. With state and federal environmental regulations continuously becoming stricter, this concern must be addressed seriously.

Constructing or remodeling a milking center is an important business decision that will have an impact on the volume and profitability of the dairy operation for many years. The milking center is the single most expensive facility in a dairy operation. Many large dairies will operate the milking parlor 18 to 20 hr per day to maximize their return on investment. Dairy owners or managers should plan expansion of the operation very carefully. It may be more economical to use hired labor and use the existing milking parlor during more hours per day than to construct a new parlor and reduce milking time to 4 to 5 hr per day. Milking parlor capacity should be determined for present and future needs. If expansion is planned for the future, new facilities need to be designed with the further flexibility in mind.

### **Financial Evaluation**

A financial evaluation to determine the practicality of expansion is extremely important. Research indicated that 68% of expanded dairy operations experienced cash flow problems for 2 yr after expansion, and 34% of these farms had serious cash-flow problems.

Producers who want to expand need to consider: capital available for expansion; return on the dairy expansion compared with use of equity for other investments; and the cash flow benefits from the expansion. Producers typically are required to contribute 30% of the expansion cost in some form of equity.

Several factors can affect milking parlor performance, including the numbers of operators and detachers, operator routine, milking interval, construction, use of a wash pen, and premilking hygiene. Analysis of parlor capacity, capital cost, capital cost per cow, milk

output per day, milk output per worker, labor cost per cwt of milk, and annual capital and labor costs should be considered along with cow throughput to maximize utilization of the milking parlor. All options concerning the milking center should be considered, including using an existing parlor during more hours per day, remodeling the existing parlor, constructing a new parlor, using multiple parlors, or adding a hospital barn to increase cow numbers.

During financial evaluation of a project, development of a preliminary facility design is necessary to estimate cost and performance of the expansion. This preliminary design would not have all of the information contained in a final design, but should be of sufficient detail to allow preliminary construction estimates for changes to existing facilities or construction of new facilities. The preliminary design also will be helpful to show the lending institution that the facility is designed properly.

The profitability over a 15-yr planning horizon must be considered carefully. Budgeting for a range of milk and beef incomes and labor and feed expenses will help avoid serious cash-flow problems.

### **Designing the Milking Center**

Performance of milking parlors has been evaluated by time and motion studies to measure steady-state throughput. However, this does not include time for cleaning the milking system, maintenance of equipment, effects of group changing, and milking the hospital string.

The performance of various types of milking parlors has been published, and parlor performance in the U.S. ranged from 25 to 401 cows per hour. Throughputs ranged from 84 to 401 cows per hour in parallel and from 60 to 205 cows per hour in herringbone parlors. Performance within a parlor type or size may vary because of milking frequency, detachers, wash pens, premilking hygiene, number of operators, and operator routine. Whether the milking facility has been remodeled or is new construction also can affect parlor performance. Data collected in parallel milking

parlors indicated that milking cows 3× per day versus 2× per day increased throughput by 8 to 10%. The use of detachers did not increase throughput with the same number of operators. Use of a wash pen increased throughput by 8 to 20%. Use of predip milking hygiene reduced parlor performance by 15 to 20%. The average number of cows milked per man hour decreased as the number of operators increased from one to four. If operators use a batch or territorial milking routine in large parlors, throughput can be reduced by 20 to 30%. Steady-state throughput is 10 to 12% higher in new parlors than in renovated parlors. Parlor performance also may be affected by future increased milk production per cow.

Milking parlor size should be large enough to allow flexibility to incorporate premilking hygiene routines. Milking parlors should be sized to incorporate different milking frequencies so that all cows can be milked once in 8 h when milking 2× per day, once in 6.5 h when milking 3× per day, and once in 5 h when milking 4× per day. Using these criteria, the milking parlor will be sized to accommodate the necessary cleaning and maintenance. Milking parlor operators often are put in situations in which the management goals are very difficult or impossible to attain.

Milking parlors need to be designed so that a group of cows can be milked in 30 to 60 min, depending on milking frequency. Observations on commercial dairy farms indicate that a group of cows should be milked in 60 min when milking 2× per day, in 45 min when milking 3× per day, and in 30 min when milking 4× per day to ensure comfort by minimizing time that cows stand on concrete and are kept away from feed. Group size should be divisible by the number of stalls on one side of the milking parlor to maximize parlor efficiency. Cows in the milking parlor can be turned over 4.3 to 4.5 times per hour with 2× per day milking and 4.8 to 4.9 times per hour with 3× per day milking. Observations of commercial dairies milking 4× per day indicate that cows can be turned over 6 times per hour. Considering the effect that milking interval has on group size, the desired milking interval should be determined early in the planning process.

Constructing the outer shell of a new milking parlor involves several options. If no future expansion is planned, the building can be constructed with no room for expansion. This is often done in situations in which acreage is not sufficient for expansion. When long-term plans include expansion, the shell can be constructed with room to add a second parlor or add stalls. If a second parlor is to be added at a later date, usually the two parlors could share a common equipment and milk storage facility. The additional space needed for expansion should be left in the front of the parlor to reduce cow entry time. Holding pens, wash pens, drip pens, and number of cows per group should be sized for the total number of cows that will be milked after the expansion. The building should be ventilated properly to maintain employee and cow comfort. Office, meeting room, break room, and rest room facilities should be incorporated to meet the needs of management.

Another option is to renovate an existing milking parlor if enough acreage is available to accommodate additional pens and waste management needs. If an existing milking parlor is to be updated to include these activities, appropriate measures must be taken to ensure that the waste management system can handle any expected increase in waste water. Storage ponds must be evaluated to guarantee that the proper storage time will be supplied. Finally, crop acreage must be evaluated to determine that the increased amount of manure nutrients will be taken up by the crops planted.

A herringbone parlor often is converted to a parallel or parabone parlor to increase the number of stalls without increasing building

size. The distance between the front of the stalls to the wall of the parlor should be a minimum of 6 ft to take advantage of rapid exit stalls. Often exit lane width is too narrow, delaying exit from the parlor. The holding, wash, or drip pen usually needs to be expanded when a parlor is remodeled. The refrigeration system and milk storage may need to be increased to compensate for additional milk. The vacuum system also may need to be upgraded.

After the design of expanded facilities is complete, the financial position of the dairy with the estimated debt load should be re-evaluated. Overall cow numbers, production goals, or debt structure may need to be modified.

### **Construction**

Construction of a new facility or remodeling of an existing facility is a time-consuming process. In general, at least 4 to 6 mo are needed to construct a new facility. Because managers want to generate income as soon as possible, cows often are ready to calve before the milking center is complete. Adequate time should be allowed for construction delays from weather and other uncontrollable variables.

Dairy producers remodeling an existing barn need to consider how cows will be milked during renovation. Options include: leasing another facility; constructing temporary facilities; moving cows to another dairy during the construction; or remodeling one side of the parlor while milking cows on the other side. Everything possible should be done to minimize stress on the cows during this process and prevent losses in milk production.