Planning a Dairy Expansion

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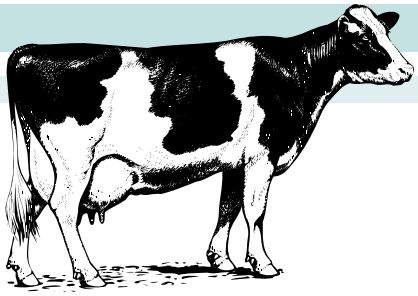

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Dairy farm size is increasing in all regions of the United States. In two of the largest dairy states, California and Wisconsin, mean herd size has increased 950 and 250 percent, respectively, since 1950. Dairy herds of 500 cows are common in all areas of the United States, and herds over 1,500 cows are common in the West and Southeast. Many dairy operations are considering expansion of existing facilities or construction of new facilities, to increase efficiency and profitability.

Before adding cows or facilities, dairy producers should answer the following questions.

- Do I want to manage employees?
- How can I improve the efficiency and profitability of the present operation?
- Can production per cow be increased?
- Could the current herd be milked 3× per day?
- Would it be possible to send the heifers to a contract raiser and expand the cow herd?
- What are my financial goals?
- Where do I want to be in five and 10 years?
- What are the expectations of other family members?
- Do I have adequate acreage to expand the herd and manage the waste?
- Do I want to deal with regulatory agencies?

These are just a few of the questions that many producers agonize over when considering options for their dairy operation. This publication will help you explore your options and make a decision that will benefit your dairy operation. It is imperative that all options be considered to make a good decision. It is a three-phase process to expand: (1) financial evaluation, (2) design, and (3) construction.

Financial Evaluation

It is extremely important that a producer conduct a financial evaluation to determine how realistic the dairy operation expansion would be. The evaluation must use realistic numbers. One study indicated 68 percent of expanded farms experienced cash flow problems for two years; of those, 34 percent had serious cash flow problems. Results from a second study, evaluating productivity in New York dairy farms from 1989 to 1992, indicated that farms which had expanded 30 percent had the highest increases in debt per cow and operating expenses per cow. However, this group of dairies also had the largest increase in net farm income, return on investment and milk sold per worker.

Producers who want to expand need to consider the amount of capital that is available for expansion, the return on the dairy expansion compared with use of equity for other investments, and the cash flow benefits from the expansion. Typically, they are required to contribute 40 percent of the expansion cost in some form of equity. The current cost of production per hundredweight and the marginal revenue per cow, as well

as the income from the expanded herd to estimate the amount of debt the expanded herd might carry must be known.

Design-Build Concept

Many owners and managers who have made the decision to expand prefer to use the design-build concept or a design team. These concepts specify that dairy management employs a dairy design consultant to develop a basic dairy design and program plan to meet the client's needs. The design team consists of a licensed engineer and supporting dairy management specialists. Dairy management specialists could include dairy extension faculty, nutritionists, milking equipment manufacturers and veterinarians. This team approach is an efficient way to integrate desired management into physical facilities. Other specialists such as environmentalist, agronomist and soil scientist, may be included on the team as additional support is needed and various permits obtained. Some of the different permits may include building, waste control, milk parlor, water usage or nutrient management.

Designing a New Milking Center

Factors Affecting Parlor Performance

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

Parlor performance in the United States ranged from 25 to 401 cows per hour. Throughput in parallel parlors ranged from 84 to 401 cows per hour, and from 60 to 205 cows per hour in herringbone parlors. Milking parlor performance within a parlor type or size may vary due to construction milking frequency, detachers, pre-milking hygiene and number of operators. The affects of these factors on parlor performance are listed below:

- Data collected in parallel milking parlors indicates that milking cows 3× per day, versus 2× per day, increases throughput 8 to 10 percent.
- The use of detachers does not increase throughput with the same number of operators.
- The use of predip milking hygiene reduces parlor performance 15 to 20 percent.
- The average number of cows milked per operator hour decreases as the number of operators increases from one to four.
- Steady-state throughput is 10 to 12 percent higher in new parlors than in renovated parlors.

Sizing the Milking Parlor

Milking parlor size should be large enough to allow management the flexibility to incorporate premilking hygiene routines. Many large dairies will maximize the number of cows that can be milked through a parlor. In this situation, milking parlors should be sized so that all cows can be milked once in 8 hours when milking 2× per day; 6.5 hours when milking 3× per day; and 5 hours when milking 4× per day. Using this criteria, the milking parlor will be sized to accommodate the cleaning and maintenance of the parlor. In smaller dairies or diverse operations when the time allowed for milking is limited (6 to 10 hours / day), reducing the operational hours of the parlor will reduce the return on investment.

Milking parlors need to be designed so that one group can be milked in 30 to 60 minutes, depending on milking frequency. Observations on commercial dairy farms would indicate that a group of cows should be milked in 60 minutes when milking 2× per day; 45 minutes when milking 3× per day; and 30 minutes when milking 4× per day. This will minimize the time cows stand on concrete and the time cows are kept away from feed and water. Group size should be divisible by the number of stalls on one side of the milking parlor. Parlor efficiency is maximized by having as many occupied stalls as possible per cycle. Typically, when sizing the milking parlor it should be assumed that the parlor can be turned over four and one-half times per hour. The number of cows that will be milked per hour can be calculated using the following formula:

Total # of stalls × 4.5 = cows milked per hour (CPH)

The number of milking cows can be calculated using the formula below:

# of milking cows = CPH × shift length (hours)

Holding Pens

Holding pens should be designed for 15 square feet per cow, and should hold at least one group of cows. Many producers oversize them by 25 percent to allow the second group to be moved into the holding pen while the first group is still being milked.

Exit Lanes

Exit lane width is dependent on the number of stalls on one side of the milking parlor. In parlors with 15 stalls or less per side, a clear width of 3 feet is acceptable. For parlors containing more than 15 stalls per side, a clear exit lane width of 5 to 6 feet is desired.

Operator Pits

Operator pits are typically 8 feet wide between curbs. The cow platform is 38 to 40 inches above the floor of the operator pit. Provisions should be made to allow for floor mat thickness if mats are to be used. The curb of the cow platform typically overhangs the operator pit wall 9 inches. Normally, the operator pit and cow platform should have a 1-percent slope to the rear of the milking parlor. Operator pits typically have 2 inches of side slope from the center of the pit to the pit walls.

Constructing the Milking Parlor Shell

There are several options available when constructing the shell of the milking parlor. 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 to the existing parlor. If a second parlor is to be added, usually the two parlors would share a common equipment and milk storage facility. If additional stalls will be added to a parlor, the space should be left in the front of the parlor to reduce cow entry time. The final size of the holding pen (number of cows per group) should be sized for the total number of cows that will be milked after the expansion. The milking facility should be properly ventilated to maintain employee and cow comfort. Office, meeting room, break room and rest room facilities should be incorporated to meet the needs of management.

Expanding Existing Facilities

Another option is to renovate an existing milking parlor, provided there is enough acreage for additional pens and waste management needs. If an existing milking parlor is updated to include these activities, appropriate measures must be taken to ensure the waste management system can handle any expected increase in waste water flows. Storage ponds must be evaluated to make sure that adequate waste water storage is available. Finally, the acreage available for manure and effluent application must be evaluated to determine how many cows can be accommodated in the facility.

Often, a herringbone parlor is converted into 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 feet to take advantage of rapid exit stalls. If a standard exit is used, the number of cows milked per hour will be reduced by the number of stalls on one side of the parlor. Often, exit lane width is too narrow, which slows down cow exit from the parlor. The holding pen usually needs to be expanded when a parlor is remodeled. The refrigeration system and milk storage area may need to be increased to compensate for additional milk production. The vacuum system may also need to be upgraded.

Selecting Cow Housing

Selecting the type of cow housing is an important decision that should be made with the lactating cow in mind. Several of the new large dairies in southwest Kansas have built drylot facilities versus freestalls. The climate in northeast Kansas does not allow the option of building a drylot facility to house lactating dairy cows. However, several configurations of freestall barns will work in northeast Kansas. It is preferred to build a 2-row or 4-row freestall barn. Disadvantages to 3-row or 6-row freestall barns are the level of heat stress and the limited feeding area in 6-row freestall barns. Producers building 6-row barns may want to seriously consider mechanically ventilating these barns. Six-row barns do require less space if this is an issue on expansion of an existing dairy.

It is essential that freestall barns are properly ventilated and stall dimensions are correct. Figure 1 shows the recommended dimensions for constructing freestalls. Freestall housing should be constructed to provide good, natural ventilation. Sidewalls should be 12 to 14 feet high to increase the volume of air in the housing area. The sidewalls should have the ability to open 75 to 100 percent. Fresh air should be introduced at the cow's level. Curtains on the sides of freestall barns allow management greater flexibility in controlling the environment around the cow. Since warm air rises, steeper sloped roofs

provide upward flow of warm air. Roof slopes for freestall housing should range from 4/12 to 6/12. Roofs with slopes less than 4/12 may have condensation and higher internal temperatures in the summer. Providing openings on the end walls, in addition to alley doors, will improve summer ventilation. Gable buildings should have a continuous ridge opening to allow warm air to escape. The ridge opening should be 2 inches for each 10 feet of building width. Naturally ventilated buildings should have a minimum of 100 feet between structures.

In the Midwest, freestall barns are typically oriented east to west to take advantage of sun angles and provide afternoon shade. Producers who construct barns north to south will have to construct an overhang on the west side. There must be adequate shade for stalls on the west side of the barn during the afternoons. Freestall barns should be located as close to the milking center as possible without restricting ventilation. The goal is to reduce the distance that cows have to walk to and from the milking parlor. Field observations indicate that the distance from the gate of the housing area to the gate of the holding pen should be a maximum of 1,000 feet for 2× milking; 700 feet for 3× milking; and 500 feet for 4× milking.

Water Availability

High producing dairy cows can consume between 30 to 50 gallons of water per day. Water should be provided to cows leaving the milking parlor. In parlors which are double 25s or smaller, one 8-foot trough is usually sufficient. In freestall housing, water should be located at all crossovers. There should be one waterer or 2 feet of tank perimeter for 10 to 20 cows.

The water system must be able to provide 75 to 100 gallons per cow per day. Peak flow rate is determined by number of waterers, assuming 100 percent utilization or milk parlor usage during cleaning. A minimum size well is probably 10 gallons per minute with 20 to 30 gallons per minute being preferred.

How Many Crossovers Do I Need?

Crossovers should be provided every 60 to 80 feet, or every 15 to 20 stalls. Crossovers are typically 10 to 12 feet wide. Producers will often reduce the number of crossovers in freestall barns to reduce construction costs. This is not a good alternative from a cow's point of view. Reducing the number of crossovers limits the cow's access to feed and water. It also reduces the total length available to construct the feed line. Very few producers stock freestall barns at one cow per stall. The tendency is to overstock freestall facilities. Therefore, reducing the number of crossovers restricts access to feed and water, and limits the space for cows at the feed line. The bottom line is that the cows suffer when the number of crossovers are reduced.

Groups of Cows

Typically, large dairies would have eight strings or groups of milking cows. There also would be pens for slow milking cows, mastitis cows, fresh cows, dry cows and springers. The slow milking pen would have capacity for 2 percent of the milking cows. The fresh pen and mastitis pen would each have the capacity for 1 percent of the milking cows. Also, a minimum of two dry cow pens and one pen for springers is usually constructed.

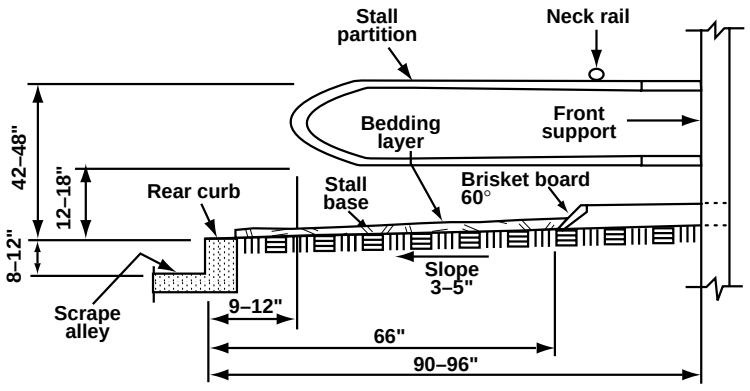

Figure 1. Freestall components and dimensions. Source: Dan McFarland and Robert Graves

Construction

Construction of a new facility or remodeling of an existing facility is a time-consuming process. In general, a minimum of four to six months are needed to construct a new facility. The team planning and permitting process may take six to 12 months before construction begins. On a new facility, a minimum of 12 months will be needed. Because managers want to generate income as soon as possible, cows are

often ready to calve before the milking center is complete. Adequate time should be allowed for construction delays due to weather and other uncontrollable variables.

Dairy producers who are remodeling an existing barn need to consider how cows will be milked during the barn renovation. Options include: leasing an alternative 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. To prevent losses in milk production, everything possible should be done to minimize stress on the cows during this process.

Increasing Cow Numbers

Producers should strive to increase lactating cow numbers as soon as the facilities are completed. Realistic goals should be set to purchase the cows and move them into the new facility. Establishing milk flow as soon as possible is desirable. However, many producers have struggled with calving heifers before the new facility is complete. Producers should work with their veterinarian to minimize the risk of bringing infectious diseases into the herd. Purchasing heifers versus cows will minimize the risk of inheriting another herd's mastitis problem. Producers who aggressively purchase heifers often underestimate the facilities and labor required to calve a large number of animals in a short period of time.

Summary

The expansion process is a drawn out and sometimes tedious process. However, dairy expansions have been rewarding for many producers. It is important to evaluate all your options. The previous guidelines are benchmarks to help you get started, and may have to be modified when applied to your dairy operation. Good luck in your future plans!

Notes:

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