

Issues with Dairy Facilities Located in the High Plains

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Introduction

Dairy facilities can have a dramatic impact on milk production and cow health. Over time, field observations and results from research trials have been used to improve dairy facilities. Producers constructing facilities in the High Plains typically try to minimize facility cost and negative impacts to the cow's environment; while maximizing milk production per cow, reproductive efficiency, and cow health.

Dairy facilities in the High Plains need to be constructed to manage significant heat stress and at the same time minimize the risk of severe winter storms. A number of facility options are available to dairy producers. The selection of dairy facilities will be dependent on management style, equity position, and the amount of risk an individual producer is willing to accept and manage. Under these conditions producers have to be extremely careful with the dollars they invest into dairy facilities. A discussion of some of the issues faced by dairy producers in the High Plains follows.

Milking Parlors, Holding Pens, and Exit Lanes

Decisions concerning the milking center are some of the most complicated decisions a dairy producer has to make. Milking procedures, herd size, expansion plans, milking interval, and the equity position of a producer influence these decisions. One parlor will not meet the

needs of all dairy producers. Producers will have to make the following decisions before they can select or develop management protocols for a milking parlor:

1. How many cows will be milked through the parlor?
2. Will the parlor need to be expanded in the future?
3. What milking procedure will be used (minimal or full)?
4. If a full milking routine is chosen; how much contact time do you want (strips per teat)?
5. Which milking routine will be used (sequential, grouping, territorial)?
6. Are you willing to train teams of milkers to operate large parallel or herringbone parlors?

Reducing the amount of time cows spend in the milking facility is very important. Facilities should be constructed to minimize the time cows are away from feed and water. Travel time to and from the parlor can be reduced by correctly sizing travel and parlor exit lanes.

Currently, parallel and rotary parlors are the two predominant types of parlors constructed. For some dairies a potential limitation of rotary parlors is that expansion is difficult. The operator pit can be constructed in parallel and herringbone parlors to allow additional stalls as the dairy expands.

Typically, milking parlors are sized so cows can be milked once in 10 h when milking 2x per day; 6.5 h when milking 3x per day; and 5 h when milking 4x per day. Using these criteria, the milking parlor will be sized to accommodate the cleaning and maintenance of the parlor.

The facility or cow group sizes are determined based on milking one group in 60 min when milking 2x, 40 min when milking 3x, and 30 min when milking 4x. Sizing groups of cows to be milked in these time frames minimizes the time cows are away from feed and water. An ideal situation would be where cows are not away from the housing area for more than a total of 4 h per day for milking. The 4 h for milking would include travel time to and from the parlor along with time spent at the milking center. If a dairy follows the recommendations above, there will be 8-10 pens of healthy lactating cows.

The drip pen and wash pen are the most challenging environments a dairy cow faces. Drip pen and wash pen cooling should be used to minimize heat stress in this area. Drip pens and wash pens are designed based on 15 ft² per cow with a group size not greater than 200 cows. If the group size is greater than 200 cows the area per cow should be increased to 16-17 ft² per cow. Ideally both the wash pen and the drip pen should be sized to hold one group of cows. When a wash pen is not used, oversizing the holding pen by 25 % allows a second group to be moved into the holding pen while the crowd gate is pulled forward and the first group is finishing being milked (Smith et al., 1997).

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 ft is acceptable. For

parlors containing more than 15 stalls per side, a clear exit lane width of 5 to 6 ft is desired (Smith et al., 1997).

The width of cow traffic lanes should be sized according to group size. When group size is less than 150 cows, 14 ft traffic lanes are typically used. Lane width is increased to 16 ft for group sizes from 150 to 250 cows, 20 ft for group sizes from 251 to 400 and to 24 ft when group size is greater than 400 cows (Armstrong, 2001).

Selecting Cow Housing

The predominant types of cow housing in the High Plains are dry-lots and freestall barns. Dairy producers are also exploring non-traditional housing systems including tunnel or cross-ventilated freestalls and Saudi or desert barns (pack barns). This decision is based on climate, management style, and equity available for constructing dairy facilities (Dhuyvetter, 2005a, 2005b).

Dry-lots

Typically, dry-lot facilities can be constructed where the moisture deficit (annual evaporation rate-annual precipitation rate) is greater than 20 in. annually (Sweeten and Wolfe, 1993). However, frequency and severity of winter rainfall and blizzards are becoming important selection criteria. These facilities would provide 500-700 ft² per lactating Holstein cow depending on the evaporation rate and 45-50 ft² of shade per cow. Pens are constructed with 2-3 % side slope and 0.5-1 % down slope. Pens with a double slope are ideal with the shade located at the high point of the pen. Constructing a dry-lot dairy such that the water drains outside of the pens is ideal; however, this is often avoided due to the cost of additional fencing. The slope of pens will have a

dramatic impact on how fast the earthen surface will dry. Mud can have a significant negative impact upon dry matter intake (DMI). Fox and Tylutki (1998) suggested that every inch of mud reduced DMI of dairy cattle 2.5 %.

Feedlines are constructed with a north-south orientation and the shades are constructed parallel to the feedline. This allows the shade to move throughout the day, resulting in the cows using different sections of the lot surface. Typically shades have a minimum height of 14 ft. Installing gutters on shades and removing the water from the pens will allow the lot surface to dry faster after inclement weather. If feedline soakers are used, it is important that the cow platform be constructed with a curb or the cow pad is sloped back to the stem wall. This will prevent the runoff from the soakers reaching the earthen surface of the pen.

Windbreaks are constructed in areas where the potential for severe winter weather exists. Windbreaks should be constructed to allow 20 % of the air to pass through. This will help prevent the turbulence behind the windbreak that occurs when solid structures are used. The snow dump generally occurs at 4 times the windbreak height and wind protection is 10 times the windbreak height. Ideally 45-50 ft² of protected area per cow is provided for Holstein cows.

It is important to realize that dry-lot housing does not allow managers the luxury of managing the risk mother nature can present in the form of rain, snow, and severe wind-chill. The advantage of dry-lot

facilities is the lower capital investment per cow as compared to freestall housing.

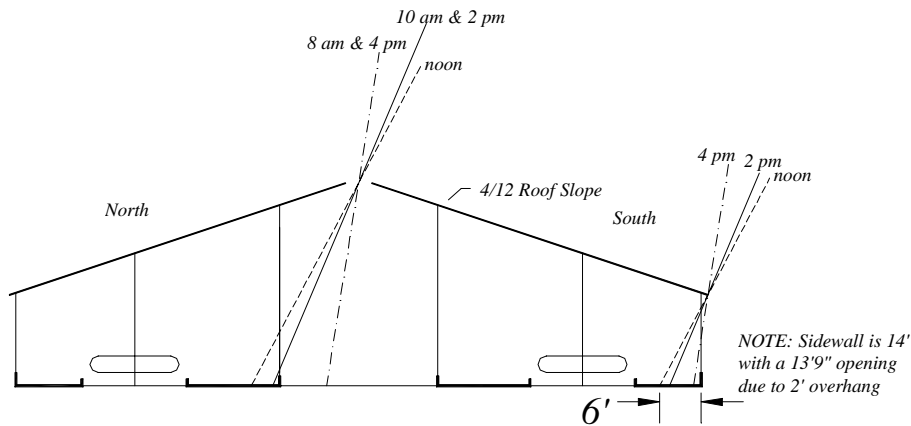
Natural Ventilated Freestall Housing

Freestall housing is usually selected to minimize the effect of weather changes, to improve cleanliness, and for enhanced cow comfort. Providing a clean, dry bed is essential to minimize the incidence of mastitis in the herd. The disadvantage of freestall housing is the higher construction cost and the costs associated with maintaining the beds and manure management.

The first freestall barn design criteria to be considered should be the orientation of the structure. Barns with a north-south orientation have a greater solar radiation exposure than barns with an east-west orientation (Figures 1 and 2). Sunlight can directly enter north-south oriented barns both in the morning and afternoon. While the afternoon sun is the most detrimental, during hot summer weather morning sun can also modify cow behavior. Because cows seek shade during the summer, direct sunlight will reduce stall usage. Thus, utilization of stalls located on the east will be impacted in the morning and on the west in the afternoon. Protection from direct sunlight is vital for effective heat stress abatement.

A trial in California showed an increase in morning and afternoon respiration rates when barns were orientated north-south versus east-west (Smith et al., 2001). Barns with an east-west orientation will provide greater protection from direct sunlight than north-south orientations.

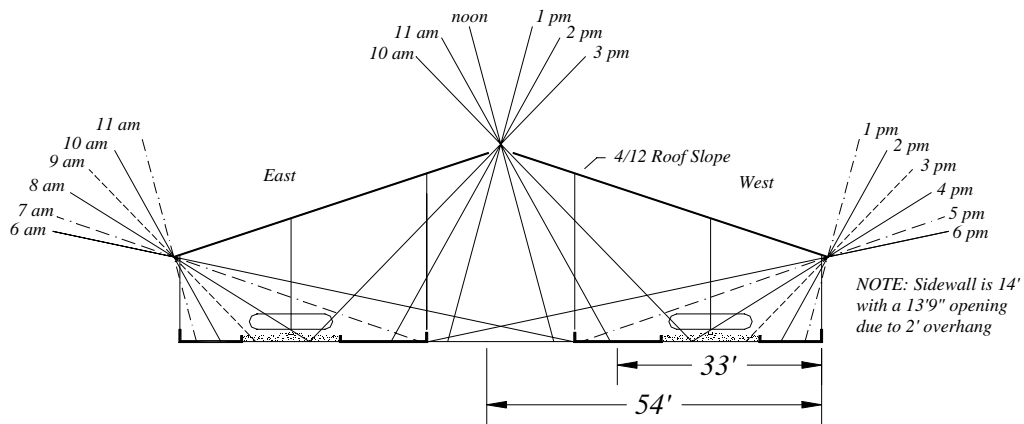
Figure 1. Sun angles of an east-west oriented freestall barn.



Sun Angles for E-W Freestall - August 21st

40 Degrees North Latitude (Omaha - Springfield)

Figure 2. Sun angles of a north-south oriented freestall barn.



Sun Angles for N-S Freestall - August 21st

40 Degrees North Latitude (Omaha - Springfield)

Maintaining adequate air quality can be easily accomplished by taking advantage of natural ventilation techniques. Armstrong et al. (1999) reported that a 4/12-pitch roof with an open ridge resulted in lower afternoon cow respiration rate increases as compared to reduced roof pitch or covering the ridge. They also observed that eave

heights of 14 ft resulted in lower increases in cow respiration rates as compared to shorter eave heights.

Designing freestall barns that allow for maximum natural airflow during the summer will reduce the effects of heat stress. Open sidewalls, open roof ridges,

correct sidewall heights and the absence of buildings or natural features that reduce airflow increase natural airflow. During the winter months, it is necessary to allow adequate ventilation to maintain air quality, while providing adequate protection from cold stress.

Naturally ventilated 4-row freestall barns are constructed with 14 ft sidewalls and 4/12 roof pitch. Two inches of ridge row opening should be provided for every 10 ft of building width. The spacing between barns should be a minimum of 1.5 times the building width. In most situations in the High Plains region, a single curtain on the north side of the freestall barn can be used to manage winter weather.

Freestall Surfaces

Sand is the bedding of choice in many areas. It provides a comfortable cushion that forms to the body of the animal. In addition, its very low organic matter content reduces mastitis risk. Sand is readily available and economical in many cases. Disadvantages may include the cost of sand and/or the issues with handling sand laden manure and separating the waste stream.

In arid climates, manure solids are composted and utilized for bedding. Producers choosing not to deal with sand or composted manure bedding, often choose from a variety of commercial freestall surface materials (e.g., mattresses).

Sonck et al. (1999) observed that when given a choice, cows prefer some materials over others. Occupancy percent ranged from over 50 to under 20 %. Researchers suggested that the increase in occupancy rate was likely influenced by the compressibility of the covering. Cows selected freestall covers that compressed to a

greater degree over those with minimal compressibility. Cows need a stall surface that conforms to the contours of the cow. Sand and materials that compress will likely provide greater comfort as demonstrated by cow preference.

Many times dairy producers would like the flexibility to convert dry-lot housing to freestall housing. This is difficult because the ideal orientation for feedlines in a dry-lot dairy is north-south. However, freestall barns are optimally oriented east-west to provide shade throughout the day.

Water Access in Housing Areas

Recommendations concerning access to water vary greatly. Current recommendations suggest a range of 1.2 to 3.6 linear in per cow (Smith et al., 2000). In the Midwest, the typical rule is one waterer or 2 linear ft of space for every 10 to 20 cows (1.2 to 2.4 in. per cow). In the Southwest, the recommendation is 3.6 linear in of space for every cow in the pen. Cow housing located in the High Plains region would ideally provide 3.6 linear in of waterer space per cow.

Another key component is that water is available in multiple locations. Typically, water is provided at each crossover in freestall barns. They should be located every 100 ft to provide adequate access to water. In 6-row and tail to tail 4-row barns, crossover width may need to be increased to obtain adequate water space. Many times the number of crossovers or crossover width is reduced to lower initial investment cost. While this may appear to be a good short term decision, this decision can have a significant impact on future milk production per cow and labor efficiency. Thus, when constructing a new dairy, this decision should not be taken lightly. Water intake is critical to maintain peak DMI.

Table 1. Recommended groups and facilities for cows housed in the special needs area.

Group	Avg. Time in Facility	% of Lactating Herd	Housing System
Close-up cows	21 days	6%	Freestalls or loose housing
Close-up heifers	21 days	4%	Freestalls or loose housing
Maternity cows & heifers	3 days	1%	Loose housing
Fresh cows & heifers, non-sellable milk	2 days	1%	Freestalls or loose housing
Fresh cows	14 days	3.5%	Freestalls
Fresh heifers	14 days	1.5%	Freestalls
Mastitis & sick cows, non-sellable milk	N/A	2-3%	Freestalls or loose housing
High risk sellable milk	N/A	2 – 6%	Freestalls or loose housing
Cull and dry cows	N/A	1.5%	Loose housing
Calf housing	24 hours		Hutches or small pens

Grouping Strategies

The size and number of cow groups on a dairy are critical planning factors. Factors affecting the number and types of groups are largely associated with maximizing cow comfort, feeding strategies, reproduction, and labor efficiency. Lactating cows are allotted to one of seven classifications:

1. Healthy lactating heifers
2. Healthy lactating cows
3. Fresh cows and heifers with non-sellable milk
4. Fresh cows with sellable milk
5. Fresh heifers with sellable milk
6. Sick cows with non-sellable milk
7. High risk sellable.

Healthy lactating heifers and cows are typically housed in 8-10 groups. The cows in classifications 3 through 7 are typically housed in the special needs area along with close-up cows and heifers. Table 1 lists suggested pens and pen sizes for different classifications of dairy cattle to be housed in the special needs facility.

Often the dairy facilities that are constructed do not match up with the management strategies the dairy would like to employ. That is, the facility provides physical barriers that do not allow the dairy manager to implement critical management strategies. For example, many times close-up facilities are under sized or do not allow the flexibility to separate heifers from mature cows. The impact of the facility in this situation can have a dramatic impact on cows and heifers for their entire lactation.

It is important to realize that these group sizes in the special needs area have been increased to account for fluctuations in calvings and cow and heifer numbers. If these pens are sized for static or average numbers there will be a considerable amount of time where the special needs facility would be over stocked. Over stocking cows prior to or after calving can have a dramatic impact on milk production and cow health.

Cow Handling Systems

The current cow handling systems are lockups, sort gates, palpation rails, chutes, and combinations of these systems. Sort gates require electronic identification. They work fairly well to sort groups of cows in the parlor to be moved, beefed, dried off, etc. Managing reproduction as cows leave the milking parlor using sort gates is very difficult. Often times cows can not be processed fast enough putting employees and veterinarians in a position where they have to watch the clock. Inevitably, a second holding pen is created increasing the time cows are away from feed and water. This also creates a situation where cows can very easily end up in the wrong pen after they are processed.

Headlocks have been used in the western United States for many years. If producers wish to lock up as many cows as possible at one time it will be necessary to provide 10 % more headlocks than holes when using 24 in spacing or provide one hole per cow when using 27 in spacing between head locks. Headlocks are a very efficient way to handle large numbers of cows; however, they can be mismanaged. Producers should strive to reduce lockup times to a maximum of 1 to 1.5 h per day. Locking cows up in the afternoon during summer months should be avoided. Heifers should be exposed to and trained to use lockups prior to entering the close-up pen.

Feed Barrier Design

The use of self-locking stanchions as a feed barrier is currently a debated subject in the dairy industry. Shipka and Arave (1995) reported that cows restrained in self-locking stanchions for a 4-h period had similar milk production and DMI as those not restrained. Arave et al. (1996a) observed similar results in another study;

however a second study showed similar intake but a 6.4 lb/cow/d decrease in milk production when cows were restrained daily for a 4-h period (9 AM to 1 PM) during the summer. Increases in cortisol levels were also noted during the summer, but not in the spring (Arave et al., 1996b) indicating increased stress during the summer as compared to the spring.

Another report (Bolinger et al., 1997) found that locking cattle for 4 h during the spring months did not affect milk production or feed intake. All of these studies compared restraining cows for 4 h to no restraint and all animals were housed in pens equipped with headlocks. The studies did not compare a neck rail barrier to self-locking stanchions, nor address the effects of training upon headlock acceptance.

The argument could be made that 4 h of continuous restraint time is excessive and much shorter times (1 h or less) should be adequate for most procedures. These studies clearly indicate that mismanagement of the self-locking stanchions, not the stanchions, resulted in decreased milk production in one of three studies with no affect upon intake in all studies.

Another study (Batchelder, 2000) compared lockups to neck rails in a 4-row barn under normal and crowded (130 % of stalls) conditions. Results of the short-term study showed a 3-5 % decrease in DMI when headlocks were used; however, no differences in milk production or body condition score were observed. It was also noted that overcrowding reduced the percentage of cows eating after milking as compared to no overcrowding. In this study, use of headlocks reduced feed intake but did not affect milk production.

A study was conducted by Brouk et al. in the summer of 2000 to determine the

effect of headlocks and neck rails on milk production and DMI. This trial was conducted on a commercial dairy and included 216 lactating Holstein cows (55, 2-year olds and 53 mature cows per pen) previously exposed to headlocks. Headlocks did not adversely affect milk production or DMI in this trial. In summary, it does not appear that headlocks adversely affect milk production if they are managed correctly.

The correct feed barrier slope is also important. Hansen and Pallesen (1998) reported that sloping the feed barrier 20° away from the cow increased feed availability because the cows could reach 5.51 in further than when the barrier was not sloped. Pushing feed up more frequently could achieve the same affect. One disadvantage of sloping the feed barrier is that feeding equipment is more likely to come in contact with the barrier, which may result in significant damage to both.

The feeding surface should be smooth to prevent damage to the cow's tongue. When eating, the side of the tongue, which is much more easily injured, often contacts the manger surface. The use of plastics, tile, coatings, etc. will provide a smooth durable surface reducing the risk of tongue injury.

Effects of Heat Stress

Mature dairy cattle generally have a thermal neutral zone of 41 to 68°F. This may vary somewhat for individual cows and conditions. Within this range, it is generally assumed that impacts upon intake are minimal. However, temperatures below or above this range alter intakes. Heat stress reduces intake, milk production, health, and reproduction of dairy cows.

Spain et al. (1998) showed that lactating cows under heat stress decreased

intake 6-16 % as compared to thermal neutral conditions. Holter et al. (1996) reported heat stress depressed intake of cows more than heifers. Other studies have reported similar results. In addition to a reduction in feed intake, there is also a 30 to 50 % reduction in the efficiency of energy utilization for milk production (McDowell et al., 1969). The cow environment can be modified or the cow can be cooled directly to reduce the effects of heat stress by providing for adequate ventilation and effective cow cooling measures.

Cooling the Cow's Environment

A number of evaporative cooling systems including high pressure fan and mister systems and tunnel or cross-ventilated facilities with evaporative pads can be used to lower the temperature of the cow's environment. These systems work best in situations where the afternoon relative humidity is low. In recent years, several fully mechanical ventilated freestall barns have been constructed. In this situation mechanical ventilation is required 24 h/d, 365 d/yr. Producers with these facilities indicate that this system allows them to provide a more consistent environment both in summer and winter. Additional work is needed to more fully evaluate these systems.

Cooling the Cow Directly

Cows can be cooled directly by using low pressure soaker systems to wet the skin of the cow. Soaker systems can be used in conjunction with fans. The fans will increase the evaporation rate of the water off the skin surface of the cow. These systems can be used in holding pens, exit lanes, and on feed lines in housing areas.

The holding pen should be cooled with fans and a soaker system. Exit lane soaker systems are an easy way to soak

cows prior to travel back to the housing area. Holding pen time should not exceed 1 h. Fans should move 1,000 cfm per cow with a minimum velocity of 6 mph. Most 30 and 36 in fans will move between 10,000 and 12,000 cfm per fan. If one fan is installed per 10 cows or 150 ft², adequate ventilation will be provided. In addition to the fans, a soaker system should deliver 0.03 gal of water per ft² of area. Cycle times are generally set to soak cows every 5-15 min depending on the temperature in the holding pen.

In naturally ventilated 4-row freestall barns, fans should be mounted above the cows on the feed line and above head-to-head freestalls. If 36 in fans are used, they should be located no more than 30 ft apart. If 48 in fans are used, they should be located no more than 40 ft apart. Fans should be mounted out of the reach of the cattle and in a manner that will not obstruct equipment movement. Fans should create an air flow of 800-900 cfm and a minimum of 6 mph per stall or headlock. Feedline sprinklers should be utilized in addition to the fans. Feedline sprinkling systems should wet the back of the cow and then shut off to allow the water to evaporate prior to another cycle beginning.

Often producers do not plan to cool cows when they are building new dairy facilities. This creates serious problems in cooling cows. The biggest bottleneck is water availability to soak cows on the feedline in cow housing areas. Another problem is the lack of provisions to provide electricity for fans. It is much more economical to include the electrical system necessary for fans when the structures are built versus retrofitting the wiring at a later date. The majority of the dairies being built today do not have adequate water or electrical systems to meet the demands of cow cooling.

When constructing dairy facilities it is important to follow the priorities for reducing heat stress below. The order of these priorities is very important. For example, you will not overcome the lack of shade by using soakers.

1. Improve water availability
2. Provide shade in the housing areas and holding pen
3. Reduce walking distance
4. Reduce time in the holding pen
5. Improve holding pen ventilation
6. Add holding pen cooling and exit lane cooling
7. Improve ventilation in cow housing areas (freestalls)
8. Cool close-up cows (3 weeks prior to calving)
9. Cool fresh cows and early lactation cows
10. Cool mid- and late-lactation cows.

Supplemental Lighting

Supplemental lighting has been shown to increase milk production and feed intake in several studies. Peters (1981) reported a 6 % increase in milk production and feed intake when cows were exposed to a 16L:8D photoperiod as compared to natural photoperiods during the fall and winter months. Median light intensities were 462 lx and 555 lx for supplemental and natural photoperiods respectively.

Chastain et al. (1997) reported a 5 % increase in feed intake when proper ventilation and lighting were provided and Miller et al. (1999) reported a 3.5 % increase without bST and 8.9 % with bST when photoperiod was increased from 9.5-14 h to 18 h. Increasing the photoperiod to 16-18 h increased feed intake. Dahl et al. (1998) reported that 24 h of supplemental lighting

did not result in additional milk production over 16 h of light.

More research is needed to determine the correct light intensity to increase intake. In modern freestall barns, the intensity varies greatly based on the location within the pen. Thus additional research is also needed to determine the intensity required for different locations within pens.

Another issue with lighting in freestall barns is milking frequency. Herds milked 3x can not provide 8 h of continuous darkness. This is especially true in large freestall barns housing several milking groups. In these situations, the lights may remain on at all times to provide lighting for moving cattle to and from the milking parlor. The continuous darkness requirement of lactating cows may be 6 h (Dahl, 2000). Thus, setting milking schedules to accommodate 6 h of continuous darkness is recommended. The use of low intensity red lights may be necessary in large barns to allow movement of animals without disruption of the dark period of other groups.

Dry cows benefit from a different photoperiod than lactating cows. Recent research (Dahl, 2000) showed dry cows exposed to short days (8L:16D) produced more ($P < .05$) milk in the next lactation than those exposed to long days (16L:8D). Petitclerc et al. (1998) reported a similar observation. Based on the results of these studies, dry cows should be exposed to short days and then exposed to long days post-calving.

Nutrient Management

Often dairy plans are made without taking a careful look at the nutrient management of the dairy facility. More

options are available today for nutrient management than were available in the past. It is critical for all components of the dairy to be compatible. For example, if sand bedding is used in freestalls the manure management system must be designed for sand laden manure.

Site selection is very critical in the High Plains region. In many areas there is competition from feedlots and swine operations for acreage to apply manure. If a dairy facility can be located to minimize the distance that manure has to be hauled it will lower the cost of handling manure. The size of the dairy operation will also have an impact on the distance manure will have to be hauled. Some producers are considering reducing the size of operations and spreading operations over larger geographical regions to reduce the distance that manure has to be hauled.

Summary

In addition to the investment required, the design of dairy facilities can have a dramatic impact on milk production and cow health. All components of the dairy must be sized correctly to create an environment that is ideal for the dairy cow and the employees who will operate the facility. Milking facilities should be constructed to minimize heat stress and time cows are away from feed and water. Minimizing travel distance to the milking parlor is essential. A number of critical decisions have to be made concerning cow housing and grouping strategies. The goal should be to have the number of groups needed to implement the management and feeding strategies the producer wishes to use.

Often bottlenecks are built into a dairy facility that prevents use of some

feeding and management techniques. Dairy facilities should be designed to maximize DMI and minimize heat stress. Providing cow cooling in the holding pen and cow housing areas is essential. The most common problem with new dairies is that time is not taken to develop both a business plan and a facility plan.

It is essential that dairy producers take a team approach when designing dairy facilities. Team members may include key employees, nutritionists, veterinarians, engineers, extension specialists, equipment manufacturers, contractors, financial advisors, etc. Many times facilities are designed and built that don't match up with the management strategies of the dairy producer or the climate where the dairy will be built. Producers will have to live with these mistakes for many years. It is important that the different components of the dairy facility compliment each other and match up with the climate where the dairy will be built. A few of the issues and decisions that dairy producers will have to make include:

Milking Management and Parlor Size

- Will you milk 2X, 3X or 4X?
 - Do you wish to increase milking frequency in early lactation?
- How much time will pre-milking hygiene require?
- How many operators will be used in the parlor?
- What automation will be installed and how will it be used?
 - Electronic ID, milk meters, detachers, sort gates, etc.
- Will a hospital parlor be used?
- Has a time budget been developed to size the parlor?

Group and parlor size

- Does the group size and parlor size match up?
 - Minimize time cows are away from feed and water
 - Not more than 4 h per day

Group size and travel lane width

- Have to be able to move cows to and from the parlor quickly

Grouping strategies and special needs facilities

- Critical through the transition period
 - Encourage DMI
 - Do not over crowd
- Special needs facilities have to be sized to accommodate fluctuations in the number of cows calving
- Do the number and size of pens match up with the management strategies?

Cow housing

- Freestalls vs. dry-lots?
- Does the type of housing match up with the climate?
- If freestalls are the choice
 - Type of bedding?
 - If sand is the choice, is the manure management system compatible?
 - Which configuration - 2, 3, 4 or 6 row?
 - Is there enough bunk space to use lockups?

Cow handling system

- Lockups vs. sort gates?
- If the choice is lockups, do you have adequate bunk space?

Heat stress management

- Cool the cow or cool the air?
 - Combination systems?
- Does the system match up with the climate?

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