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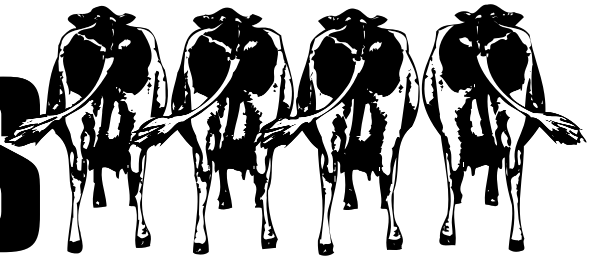
Dairy Lines



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Designing Facilities for Increased Dry Matter Intake

By Mike Brouk

Top producing herds have greater dry matter intakes than lower producing herds. The genetic potential of many cows is never reached because dry matter intake limited milk production. A key to successful dairy production is designing and managing facilities to maximize the dry matter intake of dairy cattle. Dry matter intake is affected by environmental and management factors. Environmental concerns include the physical facilities and climate conditions to which the cattle are exposed. Management factors include feeding, grouping and cow flow patterns, which may be influenced by facility design. An effective production system will provide adequate cow comfort including (1) adequate access to feed and water, (2) a clean and dry bed that is comfortable and correctly sized and constructed, and (3) acceptable air quality. In addition, the system must provide adequate and cost effective heat abatement measures to reduce the impacts of summer heat.

Feed and Water Access

Water intake is the single most important factor in maintaining high levels of intake. Lactating cows require 30 to 50 gallons of water/day. Each freestall pen should have 2 foott trough perimeter for every 10 to 20 cows. In dry lot dairies, 3 foot trough perimeter/cow is recommended. In freestalls and dry lots, multiple water troughs are necessary to reduce cow competition. Most freestall barns will have water troughs at each crossover or every 100 to 120 feet. The major mistake found in most barns is crossovers that are too narrow. This allows two cows, one at each end of the trough, to limit the access to both water and stalls. Crossovers with water troughs should be 14 feet wide to allow cows to pass while others are drinking. It also is necessary to provide water access in the parlor or along the parlor exit lanes. It generally is easier to provide water on the exit lanes as opposed to inside the parlor, but either is effective. For parlors less than 25 stall/side, a minimum of 8 foot of perimeter is needed per side and at least 16 feet/side for larger parlors. In addition, the water system must be able to provide adequate flow to meet total farm water demand. A well or source should provide a minimum of 10 gallon/min/100 cows and flow rates of 20 to 30 gallon/min/100 cows are preferred. Last, water quality must be adequate to prevent decreases in intake of both feed and water. Excessive levels of certain minerals, the presence of odors or bacteria and other anti-quality factors may ultimately reduce dry matter intake.

One of the critical decisions that producers make in building facilities is freestall barn type. The most common types are either 4- or 6-row barns and many times the cost per cow or stall is used to determine which barn should be built. The same producer who would not consider feeding least cost ration will use least-cost logic when choosing a facility that will last for 20 to 30 years. Consider the possible long-term animal effects not just construction cost similar to the logic of best-cost rations or diets that give maximum net return.

Studies suggest that providing less than 20 inches/cow of bunk space may reduce feed intake. A typical 6-row design generally only allows 18 inches/cow of bunk space when stocked at 100% of the number of freestalls. If the pen is overstocked 120%, only 15 inches/cow is provided. In contrast, a 4-row barn stocked at 100% provides almost 29 inches/cow, and at 120% overstock, 24 inches/cow of bunk space. When making the decision on barn type consider—a 4-row barn overstocked at 120% will still provide more feed bunk space than a 6-row at 100% stocking. Feed manage-

continued on page 2 and 3

Heart of America Dairy Herd Improvement Summary (Feb)

	Quartiles 1	2	3	4	Your Herd
Ayrshire					
Rolling Herd Average	17,012	14,832	13,391	10,238	
Summit Milk Yield 1st	60.5	52.0	33.0	41.3	
Summit Milk Yield 2nd	73.5	63.6	53.6	31.3	
Summit Milk Yield 3rd	78.5	67.3	43.0	53.6	
Summit Milk Yield Avg.	72.5	59.3	54.0	49.3	
Income/Feed Cost	1,529	1,181	1,033	714	
SCC Average	257	224	260	157	
Days to 1st Service	72	87	74	54	
Days Open	143.5	126	114	144	
Projected Calving Interval	13.9	13.3	12.9	13.9	
Brown Swiss					
Rolling Herd Average	18,792	15,874	14,753	12,956	
Summit Milk Yield 1st	56.1	51.1	50.8	46.7	
Summit Milk Yield 2nd	71.2	54.8	52.7	56.3	
Summit Milk Yield 3rd	82.1	69.1	65.8	54.5	
Summit Milk Yield Avg.	69.2	62.2	60.8	54.8	
Income/Feed Cost	1,780	1,493	1,379	1,131	
SCC Average	411	343	327	336	
Days to 1st Service	90	121	82	77	
Days Open	159	160	155	215	
Projected Calving Interval	14.4	14.4	14.3	16.2	
Guernsey					
Rolling Herd Average	16,055	14,361	13,597	11,479	
Summit Milk Yield 1st	57.0	51.0	49.0	44.5	
Summit Milk Yield 2nd	67.0	61.0	57.0	55.5	
Summit Milk Yield 3rd	68.0	68.0	57.0	55.5	
Summit Milk Yield Avg.	64.0	59.5	55.0	52.5	
Income/Feed Cost	1,741	1,339	1,418	1,092	
SCC Average	201	241	405	271	
Days to 1st Service	95	76	55	107	
Days Open	173	143	136	205	
Projected Calving Interval	14.9	13.9	13.7	15.9	
Holstein					
Rolling Herd Average	22,676	19,551	17,378	14,095	
Summit Milk Yield 1st	71.7	63.7	58.1	49.6	
Summit Milk Yield 2nd	91.0,	81.1	71.7	59.8	
Summit Milk Yield 3rd	96.0	86.6	77.6	65.6	
Summit Milk Yield Avg.	85.2	76.6	70.1	60.3	
Income/Feed Cost	2,151	1,742	1,524	1,174	
SCC Average	341	374	385	493	
Days to 1st Service	90	93	87	85	
Days Open	165	167	176	193	
Projected Calving Interval	14.6	14.7	15.0	15.5	
Jersey					
Rolling Herd Average	16,871	13,795	12,608	10,126	
Summit Milk Yield 1st	46.8	48.9	41.3	36.9	
Summit Milk Yield 2nd	57.1	50.6	51.6	45.6	
Summit Milk Yield 3rd	71.0	63.0	56.0	50.1	
Summit Milk Yield Avg.	64.0	56.6	50.6	44.1	
Income/Feed Cost	1,778	1,505	1,251	889	
SCC Average	297	279	325	495	
Days to 1st Service	71	59	75	82	
Days Open	141	152	127	136	
Projected Calving Interval	13.8	14.2	13.4	13.6	
Milking Shorthorn					
Rolling Herd Average	16,026	13,926	12,862	12,433	
Summit Milk Yield 1st	61.0	52.0	45.0	48.0	
Summit Milk Yield 2nd	82.0	64.0	51.0	63.0	
Summit Milk Yield 3rd	83.0	74.0	63.0	65.0	
Summit Milk Yield Avg.	76.0	64.5	55.0	58.0	
Income/Feed Cost	—	1,522	1,206	1,138	
SCC Average	84	314	407	262	
Days to 1st Service	82	78	81	29	
Days Open	136	111	146	193	
Projected Calving Interval	13.7	12.9	14.0	15.5	

ment may be able to overcome the limitation of bunk space, but it will require additional attention to detail. While feeding management may overcome the bunk space issue, 6-row barns present a unique challenge in terms of water trough space. Most freestall barns built in the Midwest have water troughs located in the crossover lanes. To increase water access in a 6-row barn, additional crossovers are required or additional troughs need to be located along the outside edge of the pen. In warm climates, it is possible to place additional water troughs on the outside edge of the barn; however, in colder climates it generally is discouraged. Thus, in colder climates, adding additional crossovers may be necessary to provide adequate water trough space in 6-row barns. This increases construction cost but could provide excellent returns.

If the cost of construction is calculated on a per cow basis rather than a per stall basis, the 4-row barn might be cheaper when the 4-row is overstocked. Also consider that the structure will be utilized for 20 to 30 years. If a pen contains 100 stalls and the cows produce 1 extra pound of milk/day, an extra 36,500 pounds of milk/pen/year or 365 pounds/stall/year. Even at $12/cwt milk, that equates to $43.80/stall/year or $876-1,314/stall over 20 to 30 years. Even if construction cost of the 4-row barn is $100 to 200/stall more than the 6-row, over the long haul, it could be the best buy. Each pound of additional dry matter intake has the potential to increase milk production 2 to 3 pounds; thus, even small increases in intake may result in significant production increases.

In addition to the effects upon access to feed and water, barn type also influences air movement, heat load, and ventilation requirements. The greater the width of the barn, the greater the reduction in natural airflow. Reduced airflow reduces air exchange, which increases ventilation requirements. Thus, wider barns (6-row) need greater sidewall height and additional fans to have similar air exchange as narrower barns (4-row). This is a critical consideration in hot and humid climates.

Another current issue in our industry is the use of self-locking stanchions as a feed barrier. Data reported is limited and conclusions differ. Researchers from Purdue University reported in 1997 that cows restrained in self-locking stanchions for a 4-hour period had similar milk production and dry matter intake as those not restrained. Researchers at Utah State observed similar results in another study conducted in the spring. However, a second Utah study showed similar intake but 6.4 lb/cow/d decrease in milk production when cows were restrained daily for a 4-hour period (9 AM to 1 PM) during the summer. Increases in cortisol levels were also noted during the summer but not in the spring indicating a greater amount of stress during the summer as compared to the spring. All of these studies compared restraining cows for 4 hours 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. However, some have drawn the conclusion that self-locking stanchions reduce milk production and only the neck rail barrier should be used. The data indicates that cows should not be restrained for periods of four 4 during the summer heat. The argument could be made that 4 hours of continuous restraint time is excessive and much shorter times (1 hour or less) should be adequate for most procedures. These studies clearly indicate that mismanagement of the self-locking stanchions, not the stanchion,s resulted in decreased milk production in one of three studies with no affect upon intake in all studies.

The correct feed barrier slope also is important. Danish researchers reported that sloping the feed barrier 20˚ away from the cow increased feed availability because the cows could reach 5.5 inches further than when the barrier was not sloped. They also noted that when feed was placed within the cow's reach much less pressure was exerted against the feed barrier indicating greater cow comfort when the barrier was sloped.

Other physical and management factors associated with the feeding area that may reduce feed intake include incorrect feed barrier neck and throat heights, rough feeding surfaces, inadequate feed delivery resulting in reduced feed availability, and very slick or rough standing surfaces resulting in injury or lameness.

Freestall Design and Bedding Selection

Cows must have stalls that are correctly sized. As early as 1954 researchers demonstrated increases in milk production when larger cows were allowed access to increased stall sizes. Today, construction costs often encourage producers to reduce stall length and width, which may reduce cow comfort and production. Cows will use freestalls that are designed correctly and maintained. If cows refuse to utilize stalls, it is likely related to design or management of the freestall area.

In addition to stall dimensions, the stall surface either increases or decreases cow comfort. 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. In many cases it is readily available and economical. In some areas it is not economical and other producers may choose not to deal with the issue of separating the sand from the manure. Since 11 to 27 kg of sand are consumed per stall per day, it should be separated from manure solids to reduce the solid load on the manure management system. Producers that choose not to deal with sand bedding often choose from a variety of commercial freestall surface materials. European researchers observed that when given a choice, cows do have a preference. Occupancy rate of the materials tested ranged from over 50 to under 20%. Researchers suggested that the differences in occupancy rate was likely influenced by the compressibility of the covering. 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.

Supplemental Lighting

Supplemental lighting has been shown to increase milk production and feed intake in several studies. Maryland researchers 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. A later Maryland study reported a 3.5% increase in intake without bST and 8.9% with bST when photoperiod was increased from 9.5-14 h to 18 h. Increasing the photoperiod to 16 to 18 h does increase feed intake. However, there is less agreement with the amount or intensity of light required for the response. Currently, recommendations range for 10 to 30 foot candles and critical areas to be lighted have not been identified. Additional research is needed to determine the intensity required for different locations within pens.

Cow Cooling

During periods of heat stress, it is necessary to reduce cow stress by increasing air flow and installing sprinkler systems. The critical areas to cool are the milking parlor, holding pen and housing area. First, these areas should provide adequate shade. Barns built with a north-south orientation allow morning and afternoon sun to enter the stalls and feeding areas and may not adequately protect the cows. Second, as temperatures increase, cows depend upon evaporative cooling to maintain core temperature. The use of sprinkler and fan systems to effectively wet and dry the cows will increase heat loss. Research has shown 3 to 8% increases in feed intake and 5 to 10% increases in milk production when these systems are used. The hair coat of the cow should become wet and then be allowed to dry prior to the beginning of the next wetting cycle. Fans may be installed to provide additional airflow, which will increase evaporation rate.

Grouping Effects

Facilities should also provide an adequate number of groups. Grouping strategies that reduce the effects of dominant cows will increase intake. Grouping heifers separately from cows has been shown to increase heifer intake 13.6% and milk production 8.7%. In addition, cows more vulnerable to competition such as transition (pre-fresh), fresh, injured, weak, etc., will benefit from reduced competition.

Critical areas of facility design related to feed intake include the access to feed and water, stall design and surface, supplemental lighting, and cow cooling. The total system should function to enhance cow comfort and intake resulting in greater returns for dairy producers.

Hay Prices*—Kansas

	Location	*Quality*	*Price ($/ton)*
Alfalfa	Southwestern Kansas	Supreme	95–110
Alfalfa	Southwestern Kansas	Premium	65–90
Alfalfa	Southwestern Kansas	Good	50–65
Alfalfa	South Central Kansas	Supreme	95–110
Alfalfa	South Central Kansas	Premium	75–90
Alfalfa	South Central Kansas	Good	55–75
Alfalfa	Southeastern Kansas	Supreme	60 cents/pt RFV
Alfalfa	Southeastern Kansas	Premium	80–90
Alfalfa	Southeastern Kansas	Good	60–75
Alfalfa	Northwestern Kansas	Supreme	—
Alfalfa	Northwestern Kansas	Premium	80–90
Alfalfa	Northwestern Kansas	Good	50–70
Alfalfa	North Central Kansas	Supreme	100
Alfalfa	North Central Kansas	Premium	75–100
Alfalfa	North Central Kansas	Good	50–70

Supreme = over 180 RFV (less than 27 ADF)
Premium = 150–180 RFV (27–30 ADF)
Good = 125–150 RFV (30–32 ADF)

Source: USDA Kansas Hay Market Report, *FEBRUARY 1, 2000*

Hay Prices—Oklahoma

	Location	*Quality*	*Price ($/ton)*
Alfalfa	Central/Western, OK	Premium	80–100
Alfalfa	Central/Western, OK	Good	75–85
Alfalfa	Panhandle, OK	Premium	85–95
Alfalfa	Panhandle, OK	Good	75–85

Source: Oklahoma Department of Agriculture, *February 3, 2000*

Feed Stuffs Prices

	Location	**Price ($/ton)**
Blood Meal	Texas Panhandle	388–390
Corn Gluten Feed	Kansas City	62–67
Corn Gluten Meal	Kansas City	245–255
Corn Hominy	Kansas City	75–76
Cotton Seed Meal	Kansas City	145–152
Whole Cotton Seed	Memphis	120
Distillers Grains	Central Illinois	73–84
Pork—Meat and Bone Meal	Texas Panhandle	162
SBM 48%	Kansas City	154–160
Wheat Middlings	Kansas City	52–55

Source: USDA Feedstuff Market Review, *FEBRUARY 2, 2000*

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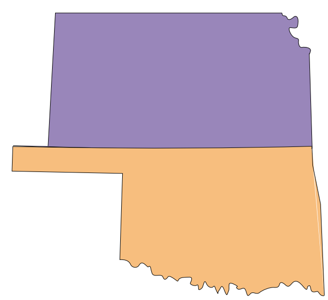

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