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Robert L. Fehr

University of Kentucky, robert.fehr@uky.edu

William L. Crist

University of Kentucky

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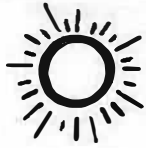
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A DAIRY COW HOUSING SYSTEM FEATURING MOTEL FREE STALLS

Robert L. Fehr
Associate Extension Professor
Agricultural Engineering Department
William L. Crist
Extension Professor
Animal Science Department
College of Agriculture
University of Kentucky

The term motel free stalls describes a milking cow housing system that utilizes roof area which protects only the free stalls. Alleys are only partially protected by the roof overhang. This system provides little protection from extreme temperatures but can provide some summer protection if properly constructed. Motel free stall systems reduce the initial cost of constructing lactating cow housing. Motel free stall system described in this paper should be used with caution in climatic regions colder than Kentucky because of limited protection from extreme cold temperatures. This paper describes the application of motel free stall housing systems and a dairy operation that utilizes them.

MOTEL FREE STALLS:

Motel free stalls can be constructed with a variety of roof shapes. A flat roofed design has been used in this area because it is a simple, low cost design, Figure 1. Advantages of the flat roofed system include simple roof framing, minimum roofing material required, and the ability to collect rain-water runoff from the roof at one point. Problems with water leakage and heat in the summer are the biggest disadvantages of flat roofed free stalls. The roofing system utilizes the free stall dividers as part of the roof support.

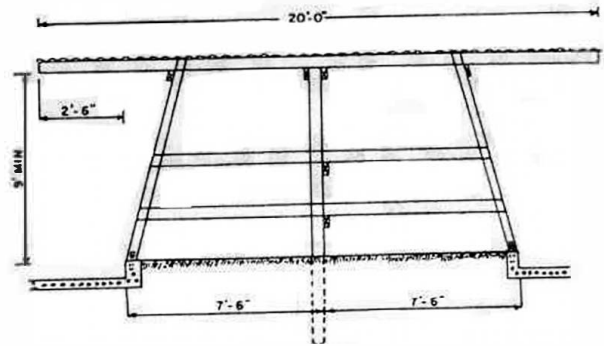


Fig. 1: Flat Roofed Motel Free Stall.

The term "flat-roofed" refers to the roof slope parallel to the free stall partitions. The flat-roofed system must be sloped to one end of a row of free stalls. Roof slopes of 1 to 2% are minimums necessary to provide some drainage. Most installations have a roof which is less than 50 feet long.

The height of the roof above the free stall base is more important when flat roofs are used. Systems with a roof height of 7 feet have caused some problems of reduced milk production in the summer. Current recommendations are for a minimum roof height of 9 feet, especially for uninsulated roofs. Because a limited area of a motel type facility is under roof, little condensation occurs on uninsulated roofs. However, insulation is recommended to maintain milk production in the summer.

A motel free stall system does not provide protection from cold temperatures. Producers who have used fixed covers for the side and end-walls to provide winter protection have had problems with heat in the summer and now use wall panels that can be opened to allow more airflow.

THE SNAPP FARM:

The motel free stall system has been used by many producers like Mr. Charles Snapp in central Kentucky who started in the dairy business with limited capital resources. In 1972, Mr. Snapp had a farm with an under utilized land resource and selected a dairy enterprise to expand its utilization. He chose a motel free stall system because its simple construction allowed him to utilize his own labor to reduce the initial investment. His present 120 free stall layout has been restricted by some existing facilities, Figure 2.

SILAGE STORAGE:

The feeding program utilizes corn silage as the main feed ingredient. Silage is stored in vertical wall concrete bunker silos. Vertical

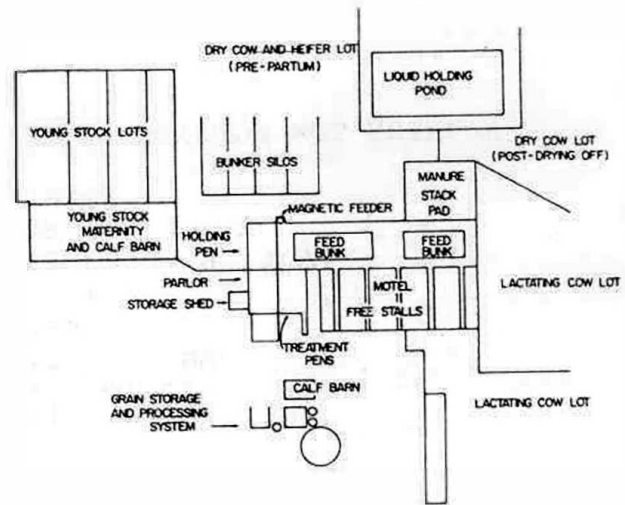


Fig. 2: Charles Snapp Farm, General Layout.

wall bunker silos were constructed because of the availability of local contractors who could use their basement wall forms during construction, which reduced the initial cost. One advantage of vertical wall bunker silos is that they can be subdivided into narrower bunkers with only a small loss of total storage capacity. The tops of the bunker silo walls are sloped toward the open end to provide a direction for water runoff. The vertical wall bunker silo system is 88' wide and 60' long. This bunker system is subdivided into two 20' x 60' bunkers and two 24' x 60' bunkers. This provides a total storage capacity of 1000 tons as fed or 320 tons of dry matter.

To fully utilize the bunker silo's capacity boards are used to cover the open end while fill-

ing and storing. The boards are supported by steel pipes placed in larger pipes that were precast into the concrete.

Use of vertical wall bunker silos requires proper packing along the outside walls to prevent spoilage. A procedure of distributing the silage with a silage blower and continuous packing results in silage which is very firmly packed.

To prevent spoilage along the top edges of the walls plastic covers are allowed to overlap substantially between units. This provides a channel for water running off the top of the bunker silos.

This procedure has successfully been used for storing both corn silage and wheat silage during the 12-years this system has been in operation. Use of vertical wall bunker silos has been increasing in this area due to their lower construction cost. Vertical walls must be properly reinforced to allow for silage load against either side of the wall.

GRAIN STORAGE AND PROCESSING:

To reduce feed costs a grain storage and processing system is utilized, Figure 3. A 10,000 bushel corn drying bin is used for storage. Storing corn for feeding on farm allows Mr. Snapp to dry the corn to a safe winter storage moisture content in the fall and then dry the corn remaining in the spring to a safe summer storage moisture content. The corn storage and drying bin is located next to a small building containing the blender-grinder unit and mineral mixer. The mineral mixer was the most recent addition to this grain processing system to allow minerals to be prepared that meet feed requirements. The blender-grinder unit meters a combination of mixed minerals, corn, soybean meal and distillers dried grain through its grinder.

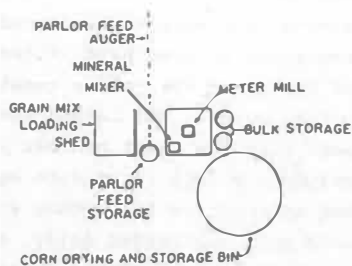


Fig. 3: Feed Processing Center.

The completed grain mix is conveyed to a parlor feed storage tank adjacent to the blender-grinder unit or to a grain mix loading shed. From the grain mix loading shed it can be transported to a calf grain mix storage tank, magnetic feeder unit or directly to the bunk silos. The grain mix used in the feed bunk is mixed and transported daily to the bunk silo area. The grain processing system allows feed rations to be developed specifically for the parlor, calf herd, the magnetic feeder and feed bunk.

FEEDING SYSTEM:

Three levels of grain mix are provided to the lactating herd. This is accomplished by dividing the herd into two groups and using a magnetic feeder, Figure 4. Grain mix is transported to the bunk silo area and blended with silage with a skid steer loader prior to being placed in the feed bunk. The feed bunk was originally designed to add a mechanical feeder but the skid steer loader is still used to distribute feed. Use of the skid loader to blend the grain mix with the silage may not appear to achieve the high level of mixing required, but observations of the feed would indicate that a good mixing job is being accomplished.

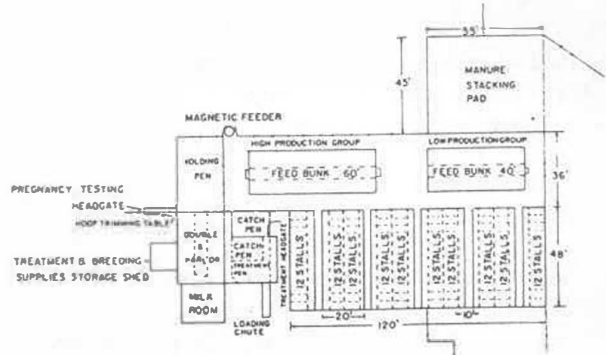


Fig. 4: Lactating Cow Housing Layout.

The feed bunk allows cattle to eat from both sides. To provide some relief from heat in the summer a sprinkler system was installed under the feed bunk roof. The sprinklers were placed there to encourage cows to eat while being sprinkled. No data are available on the economic benefit of sprinkling in this area.

The grain mix is weighed and mixed with the silage on a daily basis. Mr. Snapp feeds 15 pounds of grain mix per cow for the cows producing over 50 pounds of milk per day and 8 pounds of grain mix for the cow producing less. In addition, all cows receive grain mix

free choice in the parlor and consume 13 pounds per cow per day.

A magnetic feeder is used to increase the grain mix consumption by the highest producing cows. Its use is limited to cows which produce more than 70 pounds of milk per day. On the average, his magnetic feeder is providing 6 pounds of additional grain mix per cow per day.

Dry cows are kept in two lots. One lot contains dry cows immediately after they have been dried where they are fed dry hay and silage. The other lot is for cows and heifers just prior to calving. In addition to hay and silage this group receives some grain mix daily to prepare them for movement into the milking herd. Silage and grain mix are fed to these groups with the skid steer loader in portable feed bunks.

LACTATING COW HOUSING:

Lactating cows are housed in a motel free stall system with two covered feed bunks, Figure 4. The free stalls are arranged in 10 rows of 12 stalls. The stalls are divided to provide 72 stalls with a 60' feed bunk for the low producing group. The free stall and feeding areas provide 93 square feet of space per free stall.

In this system the free stall area is 88% covered while the feeding area is 40% covered. The roof arrangement does not allow rainfall from the roofed area to be separated from lot runoff from the unroofed area. As a result the 14,400 ft² of lot area, including free stalls, feed, holding, and manure pad areas, has a design runoff for a 25 year, 24 hour rainfall of 45,000 gallons. If the runoff from the roofed areas was separated the lot area runoff could be reduced by 50%.

The free stall base is clay with limestone, and shavings are used for bedding. The free stalls are cleaned daily and new shavings added once every two weeks.

On occasion, some problems have occurred with cows that would not use the free stalls. One concern is the width of the free stall. The 4' width measured center to center on the support posts for the free stall roof, may not be wide enough for the Holstein cows. The original design of these free stalls included the use of a wood curb. It was not successful and has been replaced with concrete.

DRY COW HOUSING:

Dry cows and pregnant heifers prior to calving are placed in a separate lot with access to a remodeled naturally ventilated tobacco barn for shelter. Dry cows and heifers have free access

to the center aisle of the barn which is bedded, Figure 5. In this remodeled barn there are also two maternity pens, one of which has insulated ceiling and walls for use during extremely cold weather.

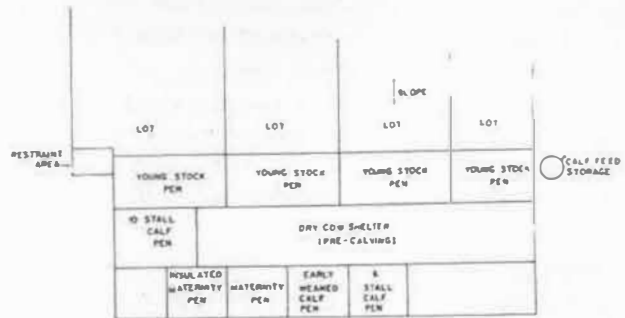


Fig. 5: Remodeled Barn.

CALF HOUSING:

After birth, calves are placed in one of three calf stall locations, Figures 2 and 5. The individual stalls have solid floors and solid partitions and are bedded and cleaned daily. Thirteen of the stalls are located in an old shed adjacent to the grain processing system that was remodeled into a fan ventilated cold calf barn, Figure 2, that remains close to the outside temperature. It is cleaned in the summer by removing all pen partitions and disinfecting the entire barn and all equipment before being allowed to stand empty for at least one month.

Calf stall pens in the remodeled tobacco barn are constructed similar to those described previously. These stalls are in locations in which natural ventilation is sufficient throughout the year to provide ventilation, Figure 5.

YOUNG STOCK HOUSING:

Upon weaning, the calves are placed in a group pen in the remodeled tobacco barn, Figure 5. This pen is bedded daily and the calves remain here from four to five weeks. The calves are then moved across the barn into the first of four young stock pens. The calves are kept in uniform age groups by moving them through the four young stock pens. The young stock pens are bedded daily, and have an outside lot. Water is provided outside in the lot area; feeding is done inside the barn.

Although these calf stalls, weaned calf pen and young stock pens require a large amount of labor for bedding, they do provide a good environment for these young calves. Death losses have been kept to a minimum.

Heifers are raised on another area of the farm; no facilities are provided in this complex for them. Prior to calving, heifers are returned and kept with the dry cows about to calve.

MANURE SYSTEM:

The waste handling system consists of a three-sided manure stacking pad and a liquid holding pond, Figure 2. Manure is placed daily in the manure stacking pond, Figure 2. Manure is placed daily in the manure stacking pad throughout most of the year. During times of the year when there is excessive rainfall use of a stacking pad is limited. The liquid holding pond holds both the runoff from the feed lot and the manure that is too liquid to be stacked. Manure stored on the stacking pad is field spread whenever possible. Liquids in the holding pond are irrigated into adjacent fields. At the present time Mr. Snapp is considering some modifications to his holding pond to allow more of the wet manure to be held in the storage pond and removed with the irrigation system. The stacking pad will continue to be used whenever possible.

MILKING CENTER:

Milking is done in a double six herringbone parlor using one operator. Automatic detachers have been added to this system since it was expanded from a single 6 herringbone. To assure that no milk containing antibiotics gets into the bulk tank, all cows which are turned dry or have received antibiotic therapy wear ankle bands.

Individual cows can be placed in the catch pen by the operator leaving the pit and manually operating the catch pen date. Consideration has been given to a remote control system allowing animals to be caught without the operator leaving the pit, but it appears to be unwarranted at this time.

ANIMAL MOVEMENT:

Proper gates are provided to restrain the high producing group while the low producing group is milked first. While the low producing group is being milked feed is placed in their bunk. Since the holding pen is not large enough to hold all the high producing group they are not fed until some have been milked.

The feeding takes place at the same time as milking to allow one individual to feed and move cows into the holding pen while the other individual operates the parlor.

To properly move animals, gates are provided around the facility. Expandable gates have been

built for use in areas where the alley widths vary. In addition to aiding in cow flow during milking, the gates make it possible to bring any cow up to the treatment facility from either of the herds with little difficulty.

TREATMENT FACILITIES:

Cows can be restrained at three different locations for three different purposes. One restraint area is located in the corner of the catch pen next to the milking parlor, Figure 4. This area is covered and has a headgate for treatment of lactating cows and for breeding. A second restraint is located adjacent to the holding area, Figure 4. It has a headgate and foot trimming table and is used primarily for pregnancy testing. The holding pen is used to contain the animals that need pregnancy testing. This reduces the amount of veterinarian time required. A third restraint area, Figure 5, allows the young stock to be worked adjacent to their holding pens.

In the restraint area next to the parlor there are two catch pens and one treatment pen with a side opening headgate. One of the catch pens is not covered. Drinking water is available in all three pens. Gates are provided to allow cows to enter the catch pen from the parlor, lactating cow area and the holding pen. Proper installation of gates enhances the usefulness of this area.

The loadout chute is located in the end of one of the treatment pens adjacent to the parlor. Cows that are to be removed from the herd can be held in this area and loaded into a truck without moving them through the herd.

Treatment and breeding supplies are held in a small insulated storage shed adjacent to the parlor, Figure 4. Initial construction of the parlor did not contain an office in the milk room to provide this type of storage.

SUMMARY:

Mr. Snapp has made every effort to obtain maximum utilization of facilities and equipment. The level of investment has been maintained at a low level without restricting milk production. Management has remained at an extremely high level. Animal health throughout the facility is a major concern from calves to the milking herd. Animal handling facilities for treatment and veterinarian work has been improved by providing treatment facilities for specific needs.

Mr. Snapp's dairy system includes many concepts that should be incorporated in any dairy system including:

1. Grain mix processing center
2. Grain mix feeding outside the parlor

3. Proper management of bunker silos
4. Blending grain mix and silage before feeding
5. Three feed groups based on production levels
6. Multiple animal restraint areas
7. Functional gate system for animal movement
8. Covered treatment pens
9. Access to dry lots for lactating cows
10. Multiple dry cow lots
11. Maternity pens
12. Functional calf housing
13. Functional young stock housing and
14. Labor efficient parlor.