

Flat-Barn Milking Systems

by Douglas J. Reinemann, H. Kenneth Bolton and Brian J. Holmes

Flat-barn milking facilities can be a good choice for dairies making the transition from milking in a stall barn to milking in an elevated parlor.

Flat-barns resemble traditional stanchion or tiestall barns with permanently mounted milking equipment and fewer milking stalls. In a flat-barn, the cows move to the milking unit rather than the milking unit moving to the cows.

The flat-barn system requires more labor than a well designed milking parlor. For example, the milker must stoop to prepare cows and attach milking units in a flat-barn. Handling cows is also slower and requires more effort than in a milking parlor.

Flat-barn milking facilities offer advantages over other transition strategies such as switching groups of cows into a stall barn. Automatic unit detachers adapt easily to flat-barn systems, thus reducing milking labor. Less over-milking and increased milking consistency are other benefits of using automatic unit detachers. A holding area and crowd gate can make moving cows easier.

Flat-barns are not commonly built as new facilities. An existing stall barn can be renovated to create a flat-barn milking system to gain some labor savings.

The cost of stall barn to flat-barn renovation can be as low as \$1,000 per milking unit if existing stalls and milking equipment are used. The cost could be as high as \$3,000 per milking unit if major stall renovations and new milking equipment are required.

The cost of a milking parlor would range from five to ten times this amount. The expected useful life of the flat-barn and the cost of building a new milking parlor should be considered when deciding whether or not to undertake a flat-barn renovation.

Design and planning considerations for a stall-barn to flat-barn renovation are presented here. These designs emphasize minimal modifications to and investment in existing barns.

Basic Components

The two basic flat-barn stall configurations are illustrated in Figure 1. Back-out stalls are similar to tiestalls or stanchions as cows must back up to exit the stall. Cows are usually handled in groups corresponding to half the number of milking stalls on each side of the barn. One milking unit usually serves two milking stalls. Back-out stalls are easily adapted to an existing stall barn.

Walk-through stalls allow the cow to proceed directly forward after milking is complete. Cows are typically handled individually. One milking unit may be provided for each stall. The number of cows milked per person-hour is similar for well managed back-out and walk-through stalls.

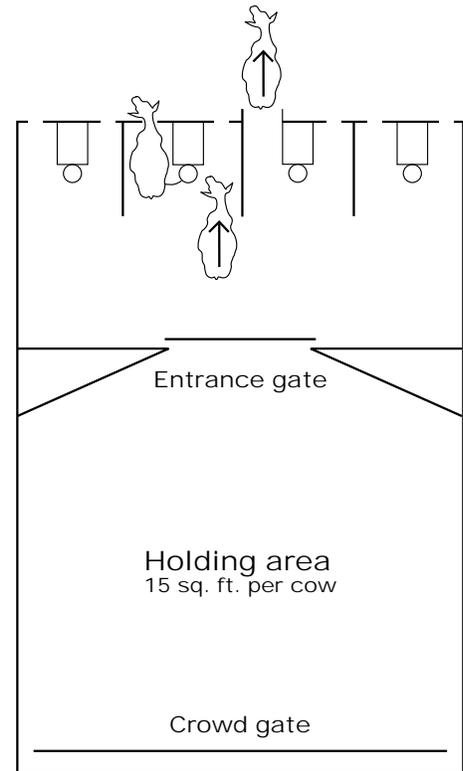
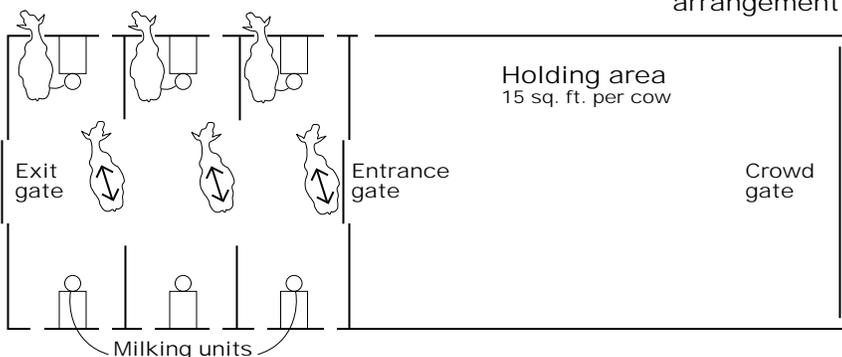


Figure 1. Basic flat-barn stall configurations.

↓ Typical back-out stall arrangement

↑ Typical walk-through stall arrangement



Leave space between cows for mounting equipment and for the milker. This space may be created by reducing the width of existing stalls. Support posts located in the middle or rear of the cow platform can present obstacles to resizing stalls. Retaining existing stall-to-stall spacing will result in minimal renovation and cost (see Figure 2.) Also, be sure to protect equipment from damage by cows.

Table 1. Milking Machine Manufacturers Council Recommendations

Minimum sizes for main vacuum supply pipelines	
Number of units	Pipe size
1-10	2.0"
11-13	2.5"
14 or more	3.0"
Minimum sizes for vacuum pulsator line	
Number of units	Pipe size
1-14	2.0"
15 or more	3.0"
Milkline sizing	
Maximum number of milker units per slope	Milking pipeline size
4	2.0"
6	2.5"
9	3.0"
Minimum CFM requirements for pipeline milking systems	
Component	ASME standard cfm
Milking unit with pulsator	6
Milk meter	1
Couplings, per 20	1
Milk inlet valves, per 10	1
Vacuum controller, each	3
Weigh jars	1
Receiver group & milk pump	0

Note 1: The 50% reserve capacity recommended is included in the table above.

Note 2: Minimum required for any system (based on 15" Hg) is 35 cfm.

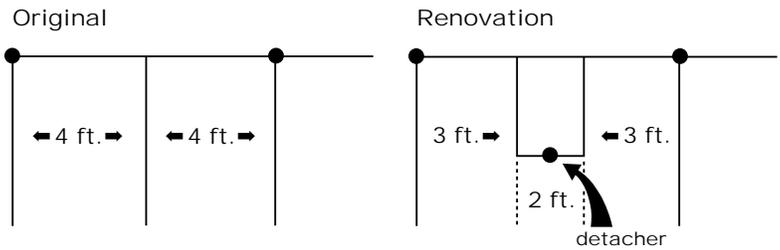


Figure 2. Renovation of existing stalls.

Milking units should remain stationary during milking to gain the full benefit of the flat-barn system. The milking units should be removed and cleaned in the milkroom after milking. A clean-in-place system may be installed, but adds considerable expense.

Re-route existing milk lines when a round-the-barn pipeline is renovated. The milk line should not run through the holding area or confinement pens to avoid damage from cows. Locate milking stalls near the milk-house to reduce the length of pipeline.

A low level milk pipeline will improve vacuum stability during milking. Disadvantages of a low level milk line include blocked aisles and the additional expense of a low line receiver group.

Existing pipeline equipment may be used if the pipe diameter and vacuum pump capacity are large enough for the number of milking units. Equipment installed in a flat-barn may also be used in a future milking parlor.

The Milking Machine Manufacturers Council recommendations for milk line and vacuum pump size are given in Table 1.

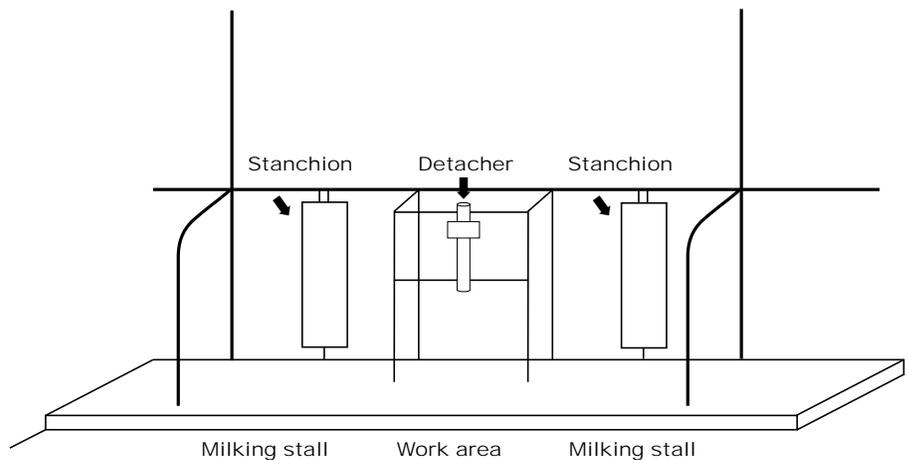
Automation

Flat-barn automation may include automatic unit detachers, powered entrance and exit gates and a powered crowd gate.

Rope or chain type detachers are more common than arm type units in flat-barns. Mount rope type detachers as close to the udder as possible to minimize the pull distance. Excessive pull distance increases the chance of milking units hitting the floor as they are being removed.

Portable unit detachers designed for use in round-the-barn pipelines systems are well suited for flat-barn applications. The detach and milking unit remain mounted during milking. After milking they are transported to the milkroom for cleaning. One method of mounting detachers is shown in Figure 3.

Figure 3. One method of mounting detachers.



Keep the milking stalls as simple as possible. If stanchions are used, group locking and release mechanisms to correspond with movement of cows. Entrance and exit gates and walk-through stall fronts can be controlled manually or with pneumatic cylinders. Pneumatically powered gates will reduce labor but are more costly. A typical powered gate is shown in Figure 4.

Size

The number of milking units and milking stalls depends on the number of milkers employed during milking and the degree of automation. One milker will be fully occupied with three to four milking units in an unautomated flat-barn. Automatic detachers and powered crowd, entrance and exit gates will permit one milker to operate six to eight units. Double these figures if two people are milking. Expect throughput in the range of 25 to 35 cows per person, per hour for an unautomated flat barn. A well-managed, fully automated flat-barn can achieve milking rates of 40 to 50 cows per person, per hour.

Holding Area and Pens

A holding area with crowd gate is a major advantage of the flat-barn system. It will pay for itself quickly in reduced labor and frustration. To calculate the minimum size of the holding area, multiply the estimated cows milked per hour by 15 to obtain square footage. A milking area and holding area will fit in most barns with room left for confinement pens.

Barn support poles can present major obstacles to installing a crowd gate. Adding more support beams can increase the length of the clear span, but may boost the cost of the remodeling project. The crowd gate can be constructed in multiple sections to accommodate existing pole spacing. The holding pen and crowd gate may also be located outside the barn.

Electrified crowd gates operate with hanging wires attached to a cow trainer controller, thus “encouraging” cows to move. Electrified gates are less expensive than pusher gates which rely on mechanical force and a moving gate to encourage the cows. The purpose of a

crowd gate is to reduce the size of the holding area as cows are milked. A crowd gate acting as a “cow-zapper” or “snowplow” is not being managed properly. The chance for misuse of an electrified crowd gate should be considered when planning the facility and the type of milking labor to be employed.

Feeding in the milking area is not recommended. Such feeding adds an extra cleaning chore and may discourage cows from leaving the milking area. If rapid cow movement is your goal, a well-managed holding pen and crowd gate is far more efficient than putting feed in the milking area.

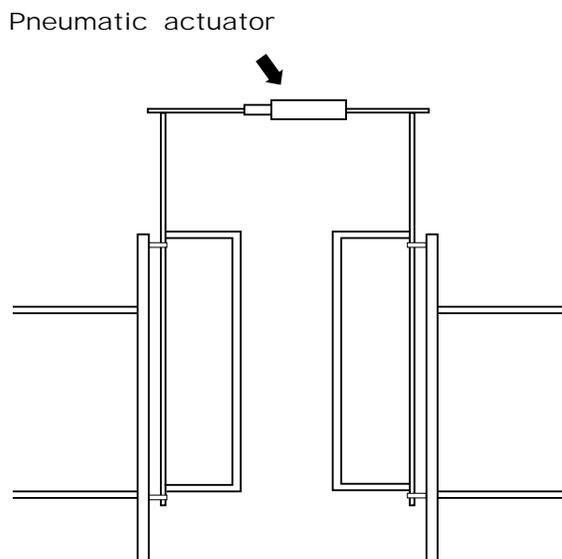


Figure 4. Typical powered entry or exit gate.

Cow Traffic

Minimizing the number of corners for cows to turn maximizes the speed at which cows move. Cow movement also proceeds more smoothly if waiting cows can see into the milking area from the holding pen. Cow traffic alleys should be a minimum of three feet wide. Provide at least three feet of head room in front of back-out stalls. Allow six feet ahead of walk-through stalls for cows to exit stalls and turn into the exit alley. Figures 5 and 6 illustrate a number of possible floor plans.

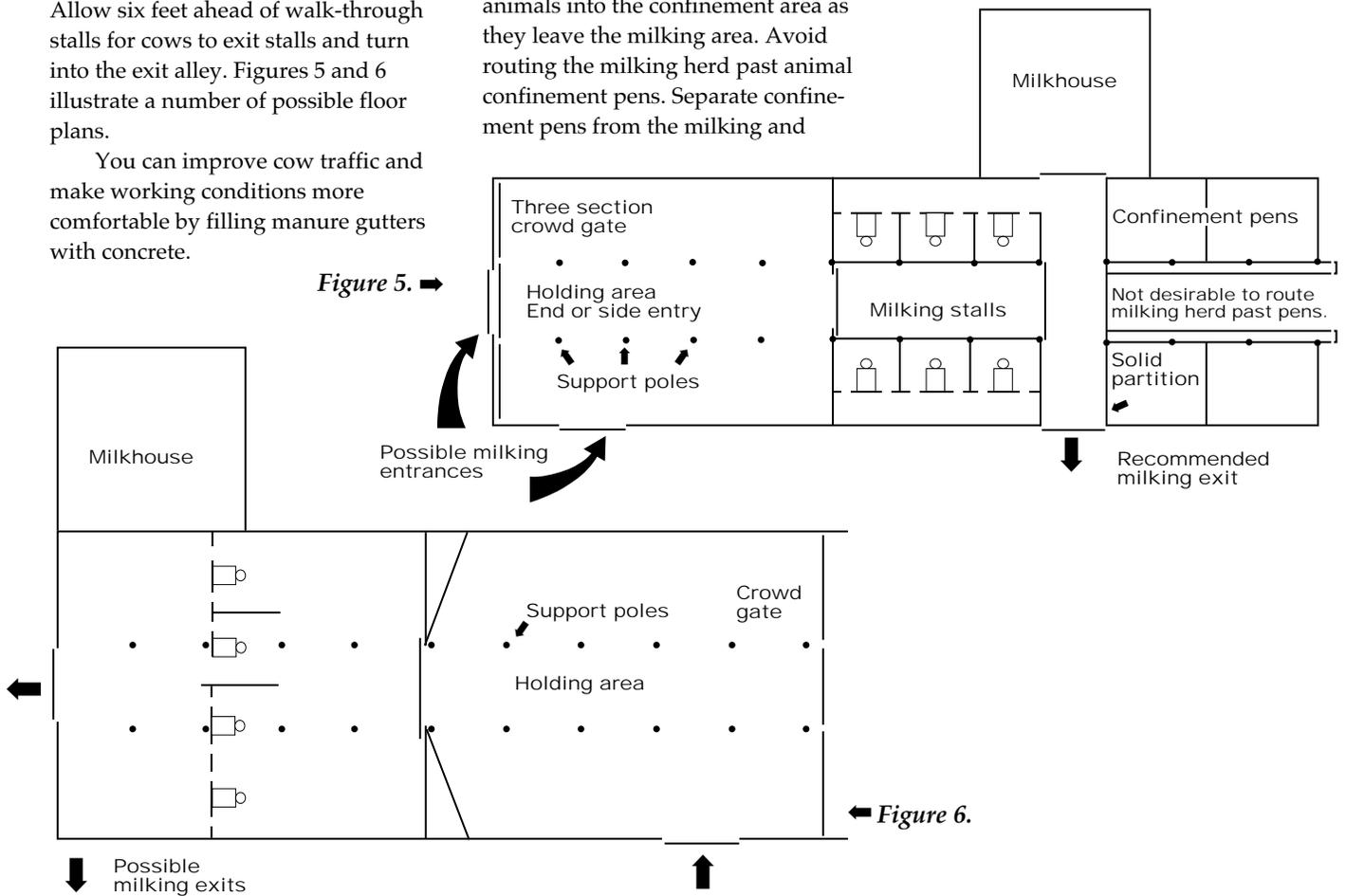
You can improve cow traffic and make working conditions more comfortable by filling manure gutters with concrete.

Cows may enter and exit the barn through the ends of the building or through a side wall. The milking herd can enter and exit through the same door if a holding area and inside return lane exist. Narrow barns may not permit a return alley inside the barn. Entrance and exit locations will also depend on site constraints.

Provide a method of diverting animals into the confinement area as they leave the milking area. Avoid routing the milking herd past animal confinement pens. Separate confinement pens from the milking and

holding area with a solid wall. House animals of like age together and provide mechanical ventilation in the confinement area.

With walk-through stalls, cows are generally released and reloaded individually. With back-out stalls, you can get maximum throughput by releasing alternate cows on one side of the barn as a group. (See Figure 1).



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