

DAIRY MODERNIZATION

By Sam Steinberg

Key items to consider when building or retrofitting a RMS barn

Robotic milking barn design

Selecting a system

Dairyman have different reasons for installing robotic milking systems (RMS). More consistent labor and improved quality of life are among the most popular reasons. One thing that is for sure, robotic milking systems are gaining popularity in the United States.

Currently, multiple models are available in North America. They are similar, each with some unique features. Choosing which model to purchase is a decision that should be based on technological features and the dealer standing behind the equipment. It is important to look at the technology available with each system and determine which features are useful additions to your herd management toolbox. The availability of a dealer to handle regular maintenance and unscheduled repairs is another important factor to consider.

Milking unit configuration

The systems currently available in the U.S. include: single milking box set ups, dual boxes in

parallel with a single robotic arm and lines up to four boxes long with a single robotic arm traveling between boxes.

Each setup has pros and cons. From the perspective of barn design, the configuration and location of the milking boxes and robotic arm has a significant effect on the pen layouts and cow flow in the barn. A single box and robotic arm set up retains the most flexibility to where it can be located in the barn.

When evaluating different robotic milking system setups, analyze the benefits and limitations of each design for their milking box-robotic arm configurations and their effects on cow flow.

Barn layout

Barn layout is somewhat dependent on whether it's a free or guided cow flow system. For a free flow design, a large open space in front of the robot units and no dead ends anywhere in the pen promote a fluid cow flow. With the proper placement of gates, an open free flow pen can be maintained, while still minimizing the labor needed to fetch or move cows. For guided flow barns, increasing the size of holding/waiting areas near sort gates and the milking units will help alleviate cow bunchups at these bottlenecks.

Typical freestall barns in North America are built with one feed delivery lane on the side of the barn or down the center. A feature seen in some European RMS barns is perimeter feeding, where feed lanes are on the outsides of pens. With perimeter feed lanes, cows can be easily moved between pens without moving them across the feed lane. This set up can also increase feed space per cow if multiple perimeter feed lanes are around a single pen.



FYI

■ Sam Steinberg is a Dairy Facilities and Environmental Systems Engineering Associate with PRO-DAIRY. Contact him at ss3242@cornell.edu.

Pens

Depending on your preferred grouping strategy, including sort gates in a RMS barn can help manage individual cows with special management groups. Using a sort gate, a special needs/lame pen can be located adjacent to the robotic milking unit. The sort gate allows these cows to share a robotic milking unit with another pen of cows.

Due to the varied milking times of cows in a robotic milking barn, headlocks in the main pen are not the most ideal method of restraining cows for herd health tasks. The use of a sort gate can also allow for a separation pen where selected cows can be sent automatically to reduce labor associated with fetching cows for procedures such as treatments, breeding or vet checks.

Taking advantage of sort gates in unison with a robotic milking system can greatly increase grouping flexibility and the ease of separation and treatment.

Regardless of the presence of sort gates/separation areas, some cows will need to be fetched and sent to the milking unit manually. A fetch pen is essential in a RMS barn to ensure all cows go through the milking unit. This can be accomplished with a pen next to the milking stall or with temporary gates.

Temperature control

As with conventional milking parlors in freestall and tie stall barns, proper ventilation remains a key factor in herd health and comfort in RMS barns. Most of the ventilation principles remain the same for RMS barns, however, additional items should be considered.

In the summer, cow cooling is vital to maintain optimal milk production and reproductive performance. The open area in front of the robotic milking units is a good spot to place cooling fans. This will help encourage cows to approach the milking stalls when the mercury rises. It is key that this isn't the only area where cooling fans are located. If the robot area is the only cool area in the pen, cows will spend an excessive amount of time here, reducing their lying times and the ability of other cows to access the milking stalls.

See <http://www.pro dairy facilities.cornell.edu/papers.php> for additional information on cooling cows.

Similar to conventional milking equipment, robotic milking systems need to be kept warm in winter. The main goal is to keep the components from freezing. This can usually be accomplished by insulating and heating the robot equipment rooms.

Manure handling

In RMS barns, with the exception of grazing herds, cows remain in the barn all day. This creates some additional manure handling challenges in the barn. RMS barns can be scraped with a skid-steer or tractor, but this will interrupt the cows' routines. Slatted floor systems can also work in RMS barns, but cows show that given a choice, they do not prefer walking on slats. Mechanical alley scrapers may be ideally suited for RMS barns as they work with all bedding materials, work with cows in the pen, and have a minimal effect on the cows' comfort.

The location of milking units also affects manure handling. If the milking units are placed in line with a row of stalls or on the side of the barn, they do not interfere with manure gathering operations.

The overall best manure handling system will depend on bedding material, barn layout, the farmstead layout and manure handling procedures/preferences.

Bedding

Similar to manure handling, bedding stalls without disrupting the cows is another challenge. Some stall beds require more frequent bedding than others. Waterbeds, mats and mattresses generally require more frequent bedding than stalls with a deep sand bed. Some RMS farmers are beginning to explore more automated systems to deliver bedding using flex augers and conveyors.

Pen layout also has an effect on bedding stalls. Pens with multiple wide alleys can accommodate moving cows into one alley momentarily while stalls off the other alley are bedded. Minimizing the turns required to get in and out of the pen to bed a row of stalls can help ease the labor associated with bedding and reduce the amount of time that the cows are disturbed.

Regardless of the chosen bedding material, proper stall management is vital to ensure proper use of stalls by cows.

Expandability

Another item to consider when evaluating a RMS barn design is the ease of expanding the design in the future to accommodate an increased number of cows and additional robotic milking units. This can be accomplished in multiple ways, including adding length to the barn or mirroring the barn over a feed delivery lane.

Wide barns with central drive through feed lanes or perimeter feed lanes are most easily expanded by adding length to the barn. Narrower barns, such as two or three row freestall barns, can be expanded by mirroring the barn over a central feed lane, essentially doubling the width of the barn. If this is a possibility, each half of the barn can be built with mono-slope roofs, resulting in a single peak in the center when finished.

When evaluating any construction project, it is important to think about how the new facility will fit in and affect the overall layout of the farmstead. A unique feature of RMS barns is that they don't need to be connected to an existing milking parlor. This increases the flexibility to fit this barn into your existing farmstead layout.

Take home points

RMS barns bring unique challenges when it comes to barn design and layout. The ideal RMS barn optimizes cow comfort and cow flow, while minimizing required labor inputs. When looking to build or retrofit a facility into a robotic milking barn, it is important to visit other dairies. The more RMS facilities you can tour, the better.

A RMS barn is a significant capital investment, however, a properly designed facility can be a productive environment for both cows and workers. □