

Time for Technology

Free or Directed Traffic? : The First Question In Barn Design for Robotic Milking

Jack Rodenburg, DairyLogix



Robotic milking and other precision technologies will dramatically change the way we house and manage dairy cows in the future. In a robotic milking barn, if cows are milked less often or if they are less comfortable, production is lower and when cows need to be fetched for milking, labour requirements are higher. Both high milking frequency and a low “fetching percentage” are critical factors in successful robotic milking. Surveys of Canadian robotic herds show that these numbers vary widely between farms. Many factors, including the feeding program, the design of the milking stall itself, foot health, udder health, the barn design, the fetching practices of the herdsman and even the genetics of the cow, influence milking frequency and the fetching percentage. Although fetching cows is no longer a big issue in well managed barns, your degree of concern about it may determine whether you choose a “free traffic” layout or a “directed traffic” layout for your robotic milking application.

Since robotic milking is still a relatively new phenomenon, the best barns will be designed to be flexible so they permit various approaches to management. But when it comes to directed or free traffic, that decision will alter the barn so much that it has to be made at the start of the design process. In a “free cow traffic” barn, cows can move freely between the free stalls and the manger area. There are no barriers directing them to the milking stall, so the decision to enter the stall for milking is truly voluntary. In a “directed cow traffic” barn, cows have to pass through the milking stall or a selection gate in one direction and a one way gate in the other, between the resting area and the manger area. If the cows are directed to the milking stall on the way to the free stalls rather than on the way to the feed manger, it is called “feed first” directed traffic. With directed traffic, if a cow wants to eat and rest she has no choice but to go through the gates that direct her through the robot. Since eating and resting are hardly a voluntary behavior, milking is also not truly voluntary in these barns.

Numerous research studies have compared these management strategies. I conducted a survey of 43 Canadian herds in 2007 in which free traffic herds reported fetching 16.2% of cows at least once per day while directed traffic herds fetched 8.5%, and other studies report similar findings. The results in Table 1, which are taken from data presented at the First North American Conference on Robotic Milking in 2002, show that the potential shortcoming of free traffic is that cows are milked less frequently. In 2002, when these data were presented, the

prevailing philosophy on barn design was that variable milking times reduced the need for manger space and stalls. Typical barns were small and crowded and designed with narrow alleys near the robot that funneled cows into the milking box, and the milking stall itself was also more restrictive and less comfortable for the cow. The 2.0 milkings per cow per day with free traffic is completely unacceptable, and while we can do much better than this today, it illustrates the point that in free traffic barns, the potential problem we face is less frequent milking and more fetching. The data also illustrates that directed traffic interferes with the cow's normal behavior. When the cow is forced to stand and wait to go through the robot either before or after every meal as is the case with directed traffic, the data shows she will choose to eat substantially fewer meals. Because she is forced into the holding area, she cannot rest until she is milked, adding substantially to the time she spends on her feet waiting for milking. This is especially true for timid cows that may be in the holding area for several hours and unable to get in the milking stall because higher ranking cows always beat them to the entry gate. These problems associated with directed traffic can be partially alleviated by directing only those cows eligible for milking into the holding area, and it has become common practice to do this with a pre-selection gate. With pre-selection, waiting times are still too long but not to the same extreme.

Table. 1. A Comparison of Cow Behaviour with Free and Guided Cow Traffic (Thune et.al. 2002)

	Free Traffic	Directed Traffic	Directed Traffic with Pre-selection
No. of milkings	2.0	2.6	2.4
No. of meals	12.1	3.9	6.5
Average time spent waiting at the robot (minutes per day)			
Dominant cows	78	140	124
Timid cows	95	240	168

With better barns, better robots and a better understanding of management today, both free traffic barns and directed traffic barns with pre-selection are yielding much better results than in 2002. But the data illustrates that successful free traffic barns need to put a lot of emphasis on making the area around the robot safe and attractive, especially for timid cows. Instead of gating to funnel them in, we have learned that a large 20 foot wide open area in front of the robot with escape routes to two alleys results in much better traffic. Ceiling fans above the

robot help to cool cows in summer and keep flies away during milking. Rubber on the floor both in the robot and beside it will improve cow comfort, as will positioning the stall so that entry is level or elevated 4 inches or less. In robotic milking stalls that restrict the cow's movement with a butt plate and adjustment of the feed manger, it is important to adjust these devices so the cow has adequate space in the stall and can stand comfortably.

Since the area near the robot will be populated by cows waiting for milking, computer feeders and cow brushes do not belong there. With the exception of a water trough, other devices should be placed in open areas far from the milking stall. Just as a large open space in front to the robot is beneficial with free traffic, directed traffic barns should provide ample open space on both sides of selection gates so cows are more confident about approaching them. Since cows will spend more time standing in these barns, dry comfortable floors in holding areas are even more critical, and since they eat fewer meals, ensuring there is good feed available at all times is also more crucial. Giving priority access to timid cows using a three way sort at pre-selection and a "priority lane", would also reduce the stress of longer wait times for these animals.

Today there are successful robotic milking herds using free cow traffic and equally successful herds using directed traffic with pre-selection. When everything is going well, the differences appear to be quite small. Free traffic herds will fetch a few more cows, while directed herds may note that fewer meals and longer waiting times lead to higher incidence of acidosis and lameness among the more timid cows. In some cases fetching a new cow in a free traffic setting can be an early warning of health problems, while such a warning may come too late in a directed traffic situation. In general, when the equipment and management are functioning well, field experience shows us that excellent results can be achieved with either system. But when management is less than ideal, with directed traffic the cow suffers the consequences of longer wait times, while with free traffic it is the farmer who suffers with more cows to fetch and reduced labour efficiency. While there is clearly room for personal preference and priorities in this choice, for me personally, when the choice is between giving priority to labour efficiency and convenience for the manager or maximum cow comfort, I am inclined to choose for cow comfort and hence for free traffic.