



Review of Robotic Milking Research

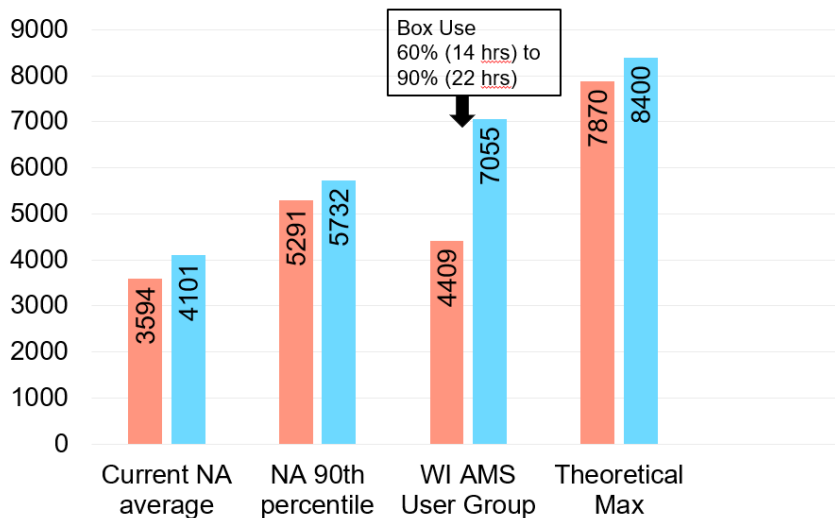
Summary by Ryan Sterry, April 2023

This is a short synopsis from Dr. Doug Reinemann's Badger Dairy Insight Webinar on Automated Milking Systems (AMS). To view a recording of the presentation, please visit:

<https://www.youtube.com/watch?v=wjKNUnGCPKE>

Milk/Box/Day

Theory and Practice: Pounds of Milk/Box/Day



Take home message: There is a wide range in observed milk production per box per day. In a study of Wisconsin herds, the average milk/box/day was 4,409 pounds, but over 7,000 pounds was shown to be possible.

from Tremblay et al (2016) and Siewert et al (2017)



Efficiency

- How to maximize the amount of milk per box per day (1)
 - Factors with significant impacts:
 - Increase fraction of day that the AMS box is occupied for milking. This involves a combination of factors that includes cow flow through the box, number of cows per box, production level, and permission settings.
 - Set minimum projected milk yield for milking permission
 - Factors that improve efficiency, but to a lesser degree
 - Milk the slowest quarter faster
 - Reduce udder prep and attach time
- Factors that determine total milk yield for all cows per milking robot (2)
 - Milk yield per cow
 - Number of cows per AMS
 - Reduce free robot time
 - Cow milking speed
 - Cow prep time

Take home message: Cows per robot and milk per cow have a large impact on efficiency. Milking speed and prep time are management factors that are also important, but to a lesser extent.

Milking Management

- Cows with both reduced milking permissions and feed allocation at the AMS experienced the greatest drop in milk production before dry off. (3)
- High milking frequency in early lactation is consistently associated with increased peak milk yield. Results were mixed, depending on lactation number, with high milking frequency averaged across the whole lactation. (4)
- Increased milking frequency in mid lactation did not increase milk yield. (5)

Take home message: Milking frequency is critical in early lactation, but less so in late lactation. The decision process in AMS is not which cows to milk, but adjusting permissions to turn away cows with insufficient milk in their udder later in lactation.

Mastitis Management

- Somatic Cell Counts are positively related to the proportion of cows with dirty udder before milking. (6)
- Culling chronically infected cows improved bulk tank somatic cell count in AMS herds infected with *Staph aureus*. (7)
- Milking interval, but not peak milk flowrate, was associated with risk of clinical mastitis. (8)

Take home message: Just with conventional milking, stall maintenance and milking clean cows makes a difference. Monitor closely for contagious mastitis pathogens. Cull problem cows early.

Feeding

- Increasing the supply of pellet in the AMS is not likely to affect voluntary visits to the AMS. (9)
- There is a positive association between daily milk yield per AMS box and: milking frequency, cow milking speed, number of cows per AMS, and dairy amount of concentrate fed in the AMS. (10)

Take home message: First focus on cow behavior and barn design to most efficiently bring cows to the AMS box before emphasizing concentrate feeding.

Behavioral Management & Grouping

- Grouping strategies intended to reduce competitive behavior, especially toward first lactation cows, could improve milking time behavior in a free-flow AMS. (11)
- Consistent social associations at the AMS may bring benefits for younger cows. (12)

Take home message: First lactation cows behave differently than second and greater lactation cows. When possible, design for dedicated first lactation pens. Depending on farm size, dedicated early lactation pens are also a consideration. The optimal robot barn may have a different number of robots per pen depending on the group of cows.

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