Automatic Milking Systems -- Producer Surveys, 2017

Introduction -- Iowa State University Extension and Outreach initiated a survey in 2017 of producers who installed an automatic milking system (AMS) on their farm. Fifteen producers responded to the survey. The farms had one to six robots per farm with a total of 41 robots. The average installation was 5-years old. A majority of the robot barns, 86%, are free-flow while 14% are partially guided or guided.

The herds averaged 155 cows before the AMS and increased 30% to 201 cows after installing the AMS. They had an average of 60 cows per AMS (range of 48 to 75). The herds reported an average of 50 to 150 cows per pen. The number of milking groups ranged from one to three with two groups being most common. They are typically sorted based on maturity (2 year old and mature cows) or milk production (high and low production). Dry cows are commonly in one or two groups; the two groups were separated by faroff and prefresh.

Milk Production and Quality -- All producers were milking 2 times per day previously, with cows now visiting the AMS an average of 2.8 times per day. Pounds of milk per cow per day increased 17% with the AMS, from 70 to 82 pounds per day. This increase could be attributed to facilities or other management factors in addition to AMS. Fat percent increased by .19% and protein percent increased .10%, both increasing Energy Corrected Milk by 15 pounds. On average, somatic cell count (SCC) dropped significantly from 223,000 to 183,000, an 18% decrease due to facility changes and AMS.

Facilities -- Prior to installing AMS, 40% of the herds milked in a parallel parlor, 26% in herringbone or para-bone parlor, 20% in tiestall, and the remaining in a step-up parlor or stanchion barn. 53% of surveyed producers built new facilities, while 47% retrofitted their existing freestall barn. After installing an AMS, 88% are housed in freestalls; 40% bedded with sand, 35% mattresses/sawdust, 5% with dried solids, and 5% waterbeds. Twenty percent of farms bed freestalls twice a week, 50% bed once a week, and 20% bed every 1.5 to 2 weeks. All farms maintain freestalls one to three times per day with 74% maintaining stalls twice a day.

Furthermore, 47% of the farms have three rows of freestalls per pen; 27% have two-rows while 26% have four to five rows. Average feeding space in lactating and dry cows was 22.9 inches, with a range of 12-54 inches. Close-up and fresh cows tended to be on the higher end of the range.

Prior to AMS installation most farms had natural ventilation for their cow housing. After AMS, 47% have natural ventilation, 29% tunnel ventilation, and 12% cross ventilation. Additionally, most farms utilize long-day lighting in their cow housing.

Feed Management -- Two-thirds of farms deliver feed twice a day with the remaining only once. The frequency of feed pushing ranged from none (bunks) to 12+ times per day (manual or automatic feed pusher). 47% of farms push up feed 12+ times per day (these farms primarily use an automatic feed pusher), and 33% manually push up feed four to six times per day. Two-thirds of producers noted feed push-up frequency affects robot visits.

Pellet palatability is a major driver of AMS success with most farms surveyed feeding one pellet through the robot; the pellet type commonly is flavored and includes protein. Pellet ingredients typically include corn and a variety of by-products such as linseed, wheat midds, molasses, soybeans, oats, and DDG's. Other feeds used through the robot are nutrient dense grain mix, roasted beans, and propylene glycol. Producers noted changes in robot feed; grain/cottonseed/protein mixes did not work well for nutrition balance and particle size due to the feed system and eating time. Also, the pellet make-up is vital, specifically percent protein and ingredients (fat/gluten). Pellet nutrient content averaged 22% crude protein and 17% NDF. PMR contained 16% crude protein, 30% NDF, and .75 NEL.

Farms feed pellets based on milk production; a majority of farms fed one pound of pellet for every 8-13 pounds of milk. The average pounds of pellet for mid-lactation was 11.7 pounds per day. Prior to dryoff the pounds of pellet fed through the robot averaged 7.7 lbs, decreasing to a low of 2 pounds of pellet per day. Cost per ton of pellet feed averaged $314 per pound. The PMR contained on average 64% forage.

Managing the feeding system is critical to the AMS success. Pellet nutrition including quality, taste, and amount fed was noted as the main nutrition factor that affected AMS visits. A second factor is properly balancing the ration between the pellets and Partial Mixed Ration (PMR) along with providing fresh, timely, high quality forage in the bunk. Additionally, cow movement (facility layout and management) and behavior can also be a factor in number of visits to the AMS.

Fresh Cow Management -- 36% of farms surveyed milk fresh cows within the first hour of calving, 36% within two to four hours and 28% over four hours. 69% of herds milk fresh cows in the robot while 31% milk in a separate milking system prior to transitioning to the robot.

Fresh cows were transitioned to the pellets over a period of time from three weeks prior to calving to in the robot post calving, and ranging from 5-16 pounds of pellet. Some farms utilized propylene glycol through the feeder or administered calcium boluses as part of their fresh cow protocol.

Manure Management -- 72% of surveyed producers clean the barns with an automatic scraper, 21% tire scrape, and 7% utilize slats. Both guided and free-flow systems adapt well to these facilities and management. For automatic scraping, 55% herd reported a continuous scrape cycle while 45% reported twice a day cycle. For manual scraping, most farms scrape twice a day. Farms utilize lagoon/pit (60%), one-stage sand (27%), and two-stage sand (13%) to handle manure.

Herd Management -- Cull rate averaged slightly down for herds, but the reasons for culling changed after AMS installation. It was noted that farms can be more selective due to increased records and AMS adaption when culling. Changed culling reasons included production, butterfat, milking speed, udder conformation, and attitude. Cows culled for udder confirmation is an average of 3.33% (0-12.5% range). It should be noted that some farms continue to milk in their prior

milking system or sell cows to a non-AMS farm; cows that do not adapt to the robot may be handled in these ways. Producers are fetching cows an average of 2.3 times per day with an average of 5 cows fetched per robot per time.

Eighty percent of the producers were extremely to somewhat satisfied with using conductivity to manage milk quality. Producers reported that they feel robot post-dipping coverage is average to excellent. However, on farm observation tends to be rated lower. AMS, similar to other farms, requires cow mobility to improve or maintain production. 21% of farms trim feet more than once a month, 21% every month to six weeks, 36% four times per year, 14% twice a year, and 7% as needed.

Reproductive Management – 87% of cows are bred in a natural heat through the activity monitoring system with some farms reporting a combination of visual, activity, and rumination monitoring. Producers reported using the same to moderately lower usage of synchronization after AMS. Farms utilized a synchronization program on 13% of cows, ranging from 2% for problem cows up to 100% for genetic reasons. Services per conception decreased to 2.1 from 2.5, while conception rate increased to 35.1% from 33.5%. Average Days to First Service remained the same at 71 days.

Repair and Maintenance -- 40% of producers surveyed reported they make at least one call to the dealer per month in repairs (33% made two calls and 27% less than one call per month). Of the calls reported on their cellphones, 51% of the calls are cow related, while 32.5% are machine repair related.

Average AMS repair cost is $7,500 per robot with a range of $3,000 to $16,500. Several producers noted they would like to address robot repair costs with routine maintenance, learn on-farm maintenance and have more suppliers/manufacturer options to purchase parts. Seventy percent of producers reported that bedding choice has an impact on higher maintenance and repair cost. They also reported an increase in electrical, water and chemical usage and cost; factors also attributed to herd growth and change in milkings per day. The AMS average cost of milk house supplies is $2,480. Teat dip is $2,250, increase of over $560 per robot after AMS.

Labor Efficiency -- Labor efficiency is a primary goal when installing an AMS. On average, producers milked 30% more cows while decreasing milking labor by 50%. Cows milked per labor hour increased from 38 to 144. This decrease in milking labor is mainly due to minimal milking labor needed. Efficiency of an AMS allows producers on average to milk cows at a labor cost of $0.38 per hundredweight, a change from $1.30 per hundredweight before installation. On a per cow basis, daily milking labor cost was reduced from $0.86 to $0.29 per cow after AMS. For one robot using a 65 cow per robot basis, producers saw milking labor savings of $13,523 per year. With the installation of an AMS, producers were able to reduce milking labor cost per day by 49%. However, some of the milking labor shifts to management of the information and records collected and provided by the robot.

Assuming a full time equivalent of 3,000 hours, cows per employee increased from 46 (30-70 range) to 79 (37-140 range) cows after AMS. Heat detection labor decreased 20 minutes per day due to activity monitoring. Producers reported an average of 51 minutes more per day in records management and 2.3 hours less per day hiring, training, and overseeing employees. Overall, labor efficiency was a tremendous savings valued at $22,488 per year, while management labor increased minimally at $5,960 per year. A net labor savings of $16,528!

Capital Investment -- The average cost per AMS was $225,385 without building costs. Building costs varied depending on degree of retrofit or new construction. Producers estimated a 17-year useful life from the AMS with $45,250 in salvage value.

Perspectives of Automatic Milking System -- Management factors for AMS success is contributed to: daily/routine maintenance, nutrition, cows (healthy and barn layout-flow), and utilizing records and data. The top reasons producers installed AMS in rank order has been:

1) **Labor Availability** (labor consistency and availability, and milking frequency)
2) **Labor Flexibility** (work in other areas of the farm)
3) **Quality of Life** (have more time for family events)

After installing the AMS, labor transitions from manual to management. Producers utilize time freed up from milking for herd health management, time with family, and crop management.

Satisfaction Index -- Producers agree that installation of AMS has improved quality of life (average of $10,000). They somewhat agree on profitability of the AMS installation and have not decided on if the AMS has improved cash flow.

Of the producers surveyed, **100% of the producers <u>agree</u> or <u>strongly agree</u> that the AMS was a good overall investment:**

1) Financial (improved production, cow health, and labor efficiency)
2) Personal (labor flexibility)
3) Management (data availability for herd health/cow care)

Summary

Producer surveys showed very positive results in switching from previous milking systems to AMS systems. An average of 30% more cows are able to be milked with an average of 50% less labor. Production increased 17% while SCC dropped 18%. Feeding and housing efficiencies were gained as well. In sum, Automatic Milking Systems gave a very positive quality of life and milking labor advantage over producer's previous systems.

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