Automatic Milking Systems-Producer Surveys

Introduction
Iowa State University Extension and Outreach initiated a survey in 2012 of producers who installed an automatic milking system (AMS) on their farm. Eight producers responded to the survey. The average installation was only 8.25 months old.
The herds averaged 149 cows before the AMS and increased 12% to 167 cows after installing the AMS. The average cost per AMS was $185,000 without building costs. Producers estimated a 13.75 year useful life from the AMS with $52,139 in salvage value.

Labor Efficiency
Labor efficiency is a primary goal when installing an AMS. On average, producers milked 12% more cows while decreasing milking labor by 75%. Heat detection labor decreased by 70% due to activity monitoring.
Producers reported an average of 37.8 minutes more per day in records management and 37 minutes less per day hiring, training, and overseeing employees. Overall, labor efficiency was a tremendous savings valued at $44,030 per year, while management labor increased minimally at $212 per year.

One of the benefits of the AMS is the reduced milking labor needed. Cows milked per labor hour increased from 21.3 to 185.2. This is a 781% decrease in milking labor, mainly due to minimal milking labor needed. However, some of the milking labor shifts to management of the information and records collected and provided by the robot. With the installation of an AMS, producers were able to reduce both the milking labor cost per cow and hundredweight by 80%.

Efficiency of an AMS allows producers on average to milk cows at a labor cost of $0.35 per hundredweight, a change from $1.93 per hundredweight before installation. On a per cow basis, daily milking labor cost was reduced from $1.34 to $0.27 per cow after AMS. For one robot using a 74 cow per robot basis, producers saw milking labor savings of $23,997 per year.

Management Practices of Dairy Producers
50% of surveyed producers built new facilities, 37.5% retrofitted their existing free stall barn, and 12.5% converted a stanchion barn to AMS. After installing an AMS, 100% are housed in freestalls with 50% bedded with sand, 37.5% mattresses/sawdust, and 12.5% mattresses/chopped straw. 50% of surveyed producers clean the barns with an automatic scraper, 25% tire scrape, and 25% utilize slats. Both guided and free-flow systems adapt well to these facilities and management.

Milk Production and Quality
All producers were milking 2 times per day previously, with cows now visiting the AMS an average of 2.9 times per day. Producers are fetching cows an average of 2.25 times per day with an average of 10 cows fetched per robot per day. Pounds of milk per cow per day increased 12% with the AMS, from 69 to 77.5 pounds per day. Much of this increase could be attributed to facilities or other management factors, not the AMS. Fat percent increased by 2.7%, while protein percent had no change. On average the somatic cell count (SCC) dropped significantly from 257,000 to 165,000, a 36% decrease due to both facility changes and AMS. 75% of the producers were extremely to moderately satisfied with using conductivity to manage milk quality.

Feed Management
Managing the feeding system is critical to the AMS success. Properly balancing the ration between the Partial Mixed Ration (PMR) and pellet drives the success of visits to the AMS. Providing fresh, timely, high quality forage in the bunk contributes to the success of the AMS as well.

Pounds of PMR dry matter averaged 0.73 lbs per pound of milk, an 8.8% decrease from the total mixed ration fed previously. Cost per pound of PMR is of low confidence in the data set due to low response rate.* Costs reported ranged from $0.08 to 0.12 per pound of PMR. 62.5% of producers are feeding the partial mixed ration 2 times per day. Pushing up feed varied from no push-up to 5 to 6 times per day to continuous with robotic pusher.

The minimum pounds of pellet fed through the robot averaged 5lbs, with 37.5% farms decreasing to 2 pounds of pellet per day 14 days prior to dry-off. The average maximum pounds of pellet of 14.5 pounds per day and fed to those in early lactation and/or high production. The pellet palatability is a major driver of AMS success with all farms surveyed feeding one pellet through the robot. Pellet ingredients typically include corn and a variety of by-products such as linseed, wheat midds, molasses, soybeans, oats, and DDG's. Cost per pound of pellet feed averaged $0.13 per pound.

Reproductive Management
87.5% of cows are bred in a natural heat through the activity monitoring system with some farms reporting they still observe for heat 1-2 times per day in addition to the activity system. Half the farms utilize a synchronization program, ranging from 1% for problem cows up to 25% of all cows in the herd. 62.5% reported using less synchronization programs than in prior system, while 25% use the same amount. Services per conception decreased 19% to 2.1, while pregnancy rate increased by 6%.

Other Issues of Concern

Producers reported a minimal change in cull rate and reasons for culling did not change after installing the AMS. They also reported a decrease in electrical use, with an increase in water and chemical usage; possibly attributed to herd growth.

Satisfaction Index

Of the producers surveyed, **100% of the producers agree or strongly agree that:**

1) The AMS has been a good personal, financial and management investment.
2) The AMS has improved cash flow.
3) The AMS has improved profitability.
4) The AMS has improved quality of life (by an average value of $22,500).

Reasons for Installing an Automatic Milking System

The top reasons producers installed AMS in rank order has been:

1) **Flexibility in Schedule (n=8).** Have more time for family events, improved quality of life were all factors.
2) **Labor Efficiency (n=5)** Ability to work in other areas of the farm, labor consistency and availability, and milking frequency were all factors.
3) **Information (n=4)** Technology, individualized cow data and mgt were all factors.
4) **Comparison of another system (n=3)** Going to build anyway, similar cost to other systems were all factors.

Automatic Milking System Survey

	Average	Range	Notes	
Months since Robot installed	0.7	4-12 months		
Annual Value to Quality of Life	$ 22,500.00	$15,000-$30,000		
Annual Value of Herd Software	$ 4,125.00	$1,500-$5,000		
Herd and Financial Assumptions				
Herd Size, Before Robot	149	85-200		
Herd Size, After Robot	167	107-260	12.1%	Increase
Cost per Robot	$ 185,000.00	$160,000-$200,000		
Cost of Robot Housing Facilities per Robot	$ 15,000.00	$15,000-$25,000		
Annual Change in Milking System Repair	$ 4,400.00	$4,000-$4,800	$ 204,400	Total Cost
Number of Robots	2	2-4		
Years of Useful Life Anticipated	15	10-20		
Value per Robot After Useful Life	$ 52,139.00	$6,475-$100,000		
Interest Rate of Money	5%	3.9-5.25%		
Increased Insurance Value of Robot. Vs. Before	$ 325,000.00	$100,000-$400,000		
Labor Changes				
Hours of Daily Milking Labor, Before Robot	15.6	8-24		
Hours of Daily Milking Labor, After Robot	3.9	1.5-8	75.0%	Decrease
Hours of Heat Detection, Before Robot	0.65	0.25-1.5		
Hours of Heat Detection, After Robot	0.20	0.25-1.5	70.0%	Decrease
Total Daily Labor Savings of 9.65 hours @ $12.50/hour = $120.63 per day, $44,030 per year				
Increased Hours for Records Management	0.63 hrs	0-1 hrs		
Reduced Hours for Labor Management	0.6 hrs	0-2 hrs		
Total Daily Labor Management Change of 0.03 hours @ $19.40/hour = $0.58 per day, $212 per year				
Milk Production and Quality Changes				
Lbs of Milk per Cow per Day, Before Robot	69.25	60-74		
Lbs of Milk per Cow per Day, After Robot	77.50	60-87	12%	Increase
Percent Fat in Milk Shipped, After Robot	3.7%	3.6-3.85%	3%	Increase
Percent Protein in Milk Shipped, After Robot	3%	2.8-3.2%	0%	Increase
Annual Bulk Tank Average SCC, After Robot	165,000	90-260,000	36.0%	Decrease
Milkings per Cow per Day, After Robot	2.9	2-3.5	45%	Increase
Goal Milkings per Cow per Day with Robot	3	2.7-3.3		
Feed Intake Changes				
Lbs of TMR Dry Matter (DM) per lb of Milk, Before Robot	0.8	.69-1.19		
Lbs of PMR Dry Matter (DM) per lb of Milk, After Robot	0.73	.52-1.4	8.8%	Decrease
Cost per lb of PMR Dry Matter, After Robot*	$ 0.10	0.08-0.12	0.0%	Increase
Cost per lb of Dry Matter Pellet Feed	$ 0.13	0.08-.19		
Lbs of Robot Feed (DM) per Cow, Average	9.4	7.5-11.0		
Minimum Lbs of Pellet Feed, Average	5	2.0-10.0		
Maximum Lbs of Pellet Feed, Average	14.5	7.5-19.0		
Reproductive and Cull Rate Changes				
Services per conception, after Robot	2.1	1-2.9	19%	Decrease
Pregnancy Rate, % after Robot	22.6%		6%	Increase
Change in Annual Turnover Rate, After Robot	-1%	(5)-0	1%	Decrease
Utility and Supply Changes				
Anticipated Change in Electricity Cost, After LCP	$ (7.52)	(20)-2		Decrease
Anticipated Change in Water Cost, After LCP	$ 0.23	(2)-2		Increase
Anticipated Change in Chemicals Cost, After LCP	$ 0.27	(2)-5		Increase

Investment Analysis

Automatic milking systems have a high initial investment cost due to the automation of the milking system. Producers estimated an annual value of herd software at $4,125. Additionally, these systems allow for software updates when needed. The annual investment cost assuming a 15 year useful life for an AMS is $336.04 per cow or $1.42 per hundredweight. If assuming a 10 year useful life, cost increased to $2.06 per hundredweight. Total annual investment and labor cost for an AMS is $1.77 per hundredweight, which is $0.50 higher than a LCP (low-cost parlor). Due to the high initial investment cost, the payback period on a robot is higher; only based on milking labor savings, payback period is 15.5 years. If increased milk production is included, expected payback period decreases to 6.5 years.

Summary

Producer surveys showed very positive results in switching from previous milking systems to AMS systems. An average of 12% more cows are able to be milked with an average of 75% less labor. Production increased 12% while SCC dropped 36%. 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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