AMS: Assessing to Improve Milk Quality

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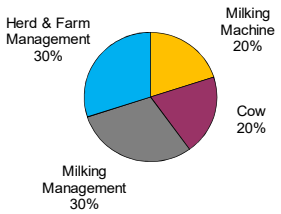
Objectives

- Understand importance of monitoring AMS function – routine maintenance and monitoring
- Understand that the physiology of the cow does not change when using AMS
- Understand the importance of building, maintaining and strengthening your relationship with an AMS provider

Potential Contribution to Mastitis



3-ways to cause mastitis from a machine

- Irregular vac fluctuations – liner slips: equipment
  - quarter level not claw level in robot
- Teat damage – overmilking: equipment
  - Individual quarter level take-off in robot
- **Transfer of contagious organisms: equipment/milking management**
  - **Number of cows/milked per milking unit versus per robot**

G. Mein et. al, Storm in a Teatcup, NMC 2004

Robot myths

- **Number of cows milkings/robot/day is low given that only 60 cows are milked/robot**
  - One AMS 60 cows
  - Mind-set for number of cows milked at each unit
- How does the number of milkings/robot compare to milkings per milking unit on a large dairy?
  - 60 cows – 1 robots 3 milkings/day = **180** milkings/robot or per milking unit
  - 60 cows – 1 robots 2.7 milkings/day = **162** milkings/robot or per milking unit
  - 100 stall rotary milking 4,500 cows 3x = **135** milkings/unit
  - 80 stall rotary milking 3,200 cows 3x = **120** milkings/unit
  - D-20 parlor milking 1,200 cows 3x = 90 milkings/unit
  - 80 cows - tie stall with 6 units milking 2x = 27 milkings/unit
- **Robots prevent or decrease incidence of mastitis?**
  - Not prevention but earlier detection for proactive management
  - Proactive management should reduce severity
  - Minimize risk of robot being vector for transfer of mastitis causing organisms

What do we measure?

- Average claw vacuum at peak flow
- Pulsation under load
- Milkline vacuum for 30 minutes
- Unit alignment scoring
- Milking routine timing
- Milk flow rate analysis
- Milking efficiency and throughput timing
- Strip yields
- Teat scoring
- Teat end cleanliness
- Udder cleanliness
- Environmental assessment

Equipment

People

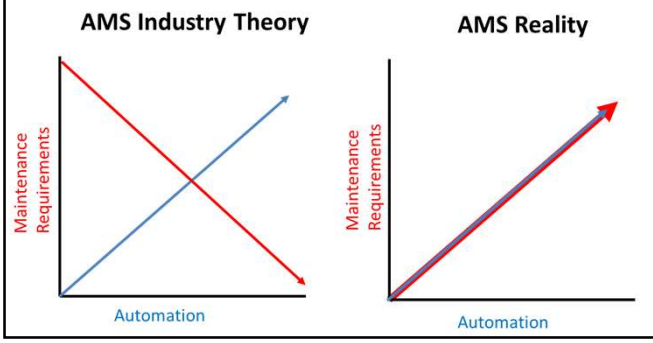
Cows

Perform full NMC evaluation if >6 months since previous

Monitoring AMS

- Pre-milking routine timing
- Udder hygiene
- Teat end cleanliness
- Post-milking teat dip coverage
- Post-milking strip yields
- Teatcup alignment
- Facility hygiene
- Teat end vacuum
- Graph pulsators
- NMC Vacuum and airflow testing
- Records analysis
  - AMS records analysis
  - Milk quality and mastitis records analysis
  - AMS efficiency
- AMS Settings
  - Low milk flow
  - Pulsation – Rate and ratio
  - Prep timing
- Controlling the AMS to complete the above tasks
- AMS mastitis and milk quality risk assessment
  - Cow
    - **Udder Hygiene**
    - **Teat end cleanliness**
    - **Dip coverage**
  - Equipment
    - Teat end vacuum
    - Vacuum stability
    - Graph pulsators
    - NMC Vacuum and airflow test
    - Lag time
  - Environment
    - Stall hygiene
    - Housing hygiene

Automation and Monitoring/Maintenance



Bulk Tank Cultures

- Still a good idea for contagious mastitis detection
  - Mycoplasma
  - *Staph aureus*
  - *Strep ag*

Milking Routine Timing

- Initial Stimulation Time (5-10 seconds)
- Pre-dip Contact Time (>30 seconds)
- Lag Time (time from start of stimulation to unit attachment) (90-180 seconds)

Are there issues with the timing if it is performed correctly?

Teat prep and lag time

- Time from prepcup attach to teatcup attached averaged 1:38
  - Goal > 1:30 - Good
- Average teatcup on-time was 3:48

Milking routine timing

- Lag time was 1:43
  - Time from brush contacting first teat until teatcup attachment
    - Shortest lag time: 1:29
    - Longest lag time: 1:52
- Excellent lag time
  - Goal 1:30 – 2:00

Robot 101	21 (53%)	**19 (48%)**
Robot 102	12 (67%)	**6 (33%)**

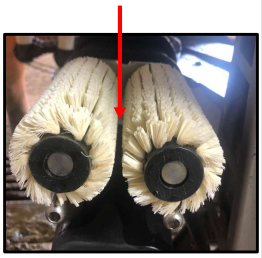
- 43% of teats scored "dirty" which does not meet the goal of <20% of teats classified as "dirty"
- The robot cannot tell if a cow has dirty teats or clean teats
  - It is imperative that cows with clean teats and udders be presented to the robot for milking in order to achieve superior milk quality

Teat end cleanliness

- Monitor teat end cleanliness on a weekly basis
- Use gauze soaked in alcohol to check teat end cleanliness
- Rub gauze across 10 teat ends after each teat end has been cleaned
- You have made changes which should have an impact on this so continue to monitor these changes.

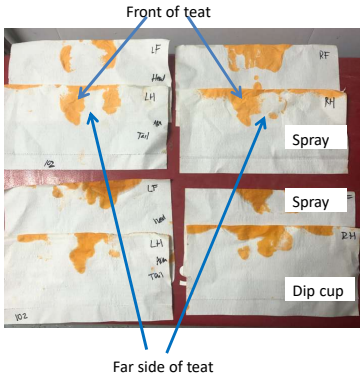
Teat end cleanliness

- Continue changes brushes on schedule
- You made some adjustments on how far it travels upward which looks to be doing better visually although our cleanliness scores were not quite as good.
- Continue to monitor this and look for areas of improvement.



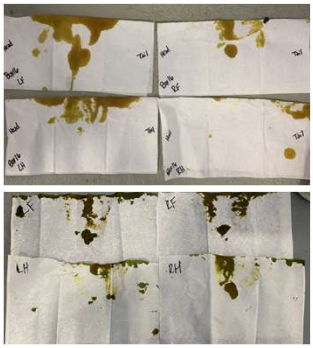
Post dip teat coverage

- Towel test
  - Wrap towel around teat after dip is applied
  - No coverage on far side of teat when spraying
  - Teat disinfectant droplet on teat end
  - Concern with not covering entire teat surface
    - Skin conditioners



Teat dip coverage

- Performed towel test to monitor teat dip coverage
  - Towels at right show a droplet at teat end
  - Minimal coverage of teat barrel
- Spray pattern, nozzle type, VMS axis settings for dip spraying

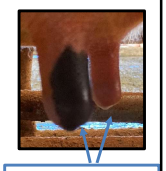


Short term teat scores – Firmness at teat end

- Teat ends were firm after milking
- **58% of cows scored with firmness at the teat end (goal ≤ 20%)**
- Indication of overmilking or improper vacuum or pulsation settings
  - Overmilking
  - D phase incorrect
  - Teat end vacuum incorrect
- Takes 60 minutes for teat ends to close after milking
  - Could take 1 – 8 hours for teat end to close when overmilking

Post-milking teat evaluation – short term

Categories	**GOAL** Percent of cows with one or more abnormal teats	**FARM DATA** Percent of cows with one or more abnormal teats
Teat Color	<20%	**40%**
Hardness at Teat End	<20%	**72%**
Swelling near Teat Base	<20%	**<1%**
Hemorrhage	<10%	**<1%**
Total Cows Scored	>20%	25 Cows



Firmness at the teat end

- There are too many teats with edema or hardness at the teat end after the teat cup is removed.
- In broad terms, this is evidence of too much time in low flow (<2 lbs/min) at higher vacuum since pulsation parameters were measured to be within normal limits.
- We recommend to adjust the automatic take-offs to remove teat cups quicker (milk cows wetter). Also as we discussed, there may be value in talking with your dealership about other liner choices that may help this situation.

Post-milking teat evaluation – long term

Categories	**GOAL** Percent of cows with one or more abnormal teats	**FARM DATA (JULY)** Percent of cows with one or more abnormal teats
Teat End Score	<20%	**44%**
Teat Skin Condition	<20%	**48%**
Open Lesions	<5%	**<1%**
Total Cows Scored	>20%	25 cows

- Teat end scores are above the goal which matches with the abnormal short term teat scores noted on the last slide
- Teat skin condition is an area of opportunity on your farm as there are too many dry teats
  - Post-dip coverage needs to be greatly improved so that the skin conditioners in the post-dip can help improve skin condition.
  - We recommend to increase the emollient package of the post-dip.

Strip yields

Measurements	**Value (Cows)**	**Value (Quarters)**	**Goal**
Total strip yield measurements	12	48	≥ 30
Ave (ml)	58	14	≥ 150 ml
Total measurements ≥ 150 ml	0	0	
% of measurements ≥ 150 ml	**0%**	**0%**	≥ 80%

- Hand stripped each quarter for 15 seconds
- Recorded total milk from all four quarters and each individual quarter
- Goal: 80% of cows have >150 ml or 5 oz.
  - Ave 58 mls
  - On the cow level 0% of hand strip yields were > 150 ml
    - Overmilking
    - Adjust take-off to come off sooner
- Quarter level strip yields were recorded also
  - Ave 14 mls
  - 0% were over 150 mls

Teatcup takeoff settings

- Evaluate these based on manufacturers guidelines and have dealership adjust these as necessary.

Teat vacuum and liner

- Average claw vacuum during peak milk flow was 10.7” Hg which is in the range for the liner you are using.

Pulsation

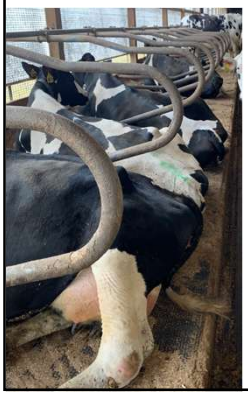
- Static pulsation – All pulsators were graphed and met the ASAE recommendations.
  - Rate: 63
  - Ratio: 64:36
    - B-phase: 451- 478 ms
    - D-phase: 238 – 260 ms
- Pulsation during milking
  - D phase stayed above 200 ms during milking

Udder hygiene

Pen 1	43 (93%)	3 (7%)
Dry Cows	11 (100%)	0 (0%)

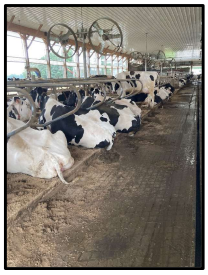
- Udder Hygiene scoring showed only 5% of your cows that scored 3 or 4 which meets the goal of less than 20% in category 3 or 4.
- Keep up the good work!

Cow positioning



- Cow positioning was dependent upon the pen and presence of a brisket
- Cleaner cows and stalls in pens with brisket boards
- Some cows too far forward and others had their rump over the curb

Lactating and Dry Cow Stalls



- Cow positioning looked good with 98% of cows positioned well. Bedding levels were better this time with 80% of the stalls having adequate bedding. For stall cleanliness, 95% of the stalls that we scored were clean.

Management

- Manage mechanics of robot – routine tasks
  - Daily, weekly, monthly routine service
    - Pulsation, vacuum, camera, laser, greasing, manual cleaning, calibrating, etc..
  - Automation does not mean less manual tasks
    - Automated equipment require daily – monthly maintenance

Management

- Manage records or reports
  - Cow and equipment
  - Monitor reports 2 – 3 times daily
- Manage the risk of the robot being a vector for the movement of mastitis causing organisms
  - Use the technology of the robot to minimize risks
    - Include an extra backflush, rinse after an at risk cow is milked
  - Pen level management – moving high risk cows to one pen

Equipment monitoring

- Robot will inform you if there is a mechanical issue
- Robots will inform you of when you should change wear items
  - Liners and other rubber goods
- Robot reports
  - Daily milking reports can be a useful tool to monitor the mechanics of the robot
    - Box time, treatment time, compare milking time of front teats to front teats and rear teats to rear teats

Robot maintenance

- 8 hours/week
  - Daily, Weekly, Bi-weekly and Monthly tasks
- Cleaning lenses and area around laser
- Check that each liner is pulsating
  - Finger in liner – open and close
- Monitor for tears
  - Liners, hoses, gaskets
- Look for irritation of liner from backflushing chemicals and steam
- Greasing, checking fluids, cylinders, air filters, gaskets, etc..
- Monthly – pulsators and claw vacuum
- Maintenance cost per robot cost $7,000 - $12,000 annually
  - $600/month to $1000/month
    - Hygiene and service = cost of ownership
- Service/repairs annually cost $2,000/robot

What data can we get from a robot

- Quarter level – milking
  - Milk yield
  - Average milk flow
  - Milking time
  - Conductivity
  - SCC
  - Color
- Quarter level – mechanics
  - Teat position
  - Attachment attempts
  - Pre-milking prep time
- Udder Level
  - Milk yield
  - Fat
  - Protein
  - Lactose
  - Average milk flow
  - Milk temperature
- Cow level
  - Activity
  - Rumination
- Box level
  - Box time
  - Treatment time
  - Visit data

Reports

Equipment monitoring

- Monitor robot reports for equipment function
  - Front teats as compared to front teas should not differ by more than 20 seconds for milking time
  - Rear teats as compared to rear teas should not differ by more than 20 seconds for milking time
  - Multiple robots in same pen should have similar box times
- Tear in liner – low or fluctuating vacuum
- Pulsation – less B-phase, pulsator not pulsing at all, tear in pulsation hose, dirty air

Failed or incomplete milkings

Do failed or incomplete milkings happen because of faulty milking equipment or because of the cow?

Failed or incomplete milkings

- Failed or incomplete milking occur for what reason?
  - Equipment failure
  - Cow – fresh animal kicks unit off, can't attach teatcups because of udder hygiene, mastitis, etc..
- Failed/incomplete milkings at one robot when there are multiple robots is an indication of a mechanical issue
- How much time does a failed/incomplete milking take up?
  - 4 – 5 minutes or more
  - Reduce failed or incomplete milkings by 2 per milking shift (between cleanings) and there is an extra 30 minutes of milking time each day
    - This doesn't include additional time required to fetch a cow if fetching is required after a failed milking

Milk quality

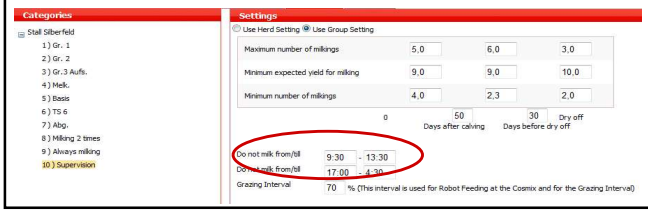
- How do we determine if a cow has mastitis when milking in a tie stall barn or parlor?
  - Clots/flakes – abnormal milk
  - Bloody or watery milk – abnormal milk
  - Swollen or hard quarter – inflammation
  - Decreased milk production
  - Down cow – systemic mastitis
  - CMT
- Don't out guess the biology of the cow because there is robotic technology involved

Milk quality - Robot

- How does a robot indicate if a cow may have mastitis?
  - Color sensor - Bloody milk
  - Temperature of milk - Swollen or hard quarter
  - Milk deviation - Decreased milk production
  - Milking time – short or long milking time at quarter level
  - Conductivity – CMT
- Not much has changed in how we determine if there is mastitis
  - Still have to evaluate the cow to determine what caused the health alert/attention
  - Cow evaluation and/or treatment should not take place in robot
    - Evaluation/treatment in robot may be a negative experience for cow
    - Negative experience may lead to cow not willingly visiting robot

Group with special Setting

- Cows with high SCC or known mastitis causing organism
  - Staph aureus positive cow
- Restrict to milk 4 hours prior to wash
- Cow to monitor and want her to milk while you are in the barn the setup to send notification to you



Managing milk quality

- High risk cows in the herd
  - Staph aureus cows remain in the herd
  - What can you do with robotic technology to limit the risk of transferring Staph aureus via the robot?
    - Multiple pens – limit Staph aureus cows to 1 pen
    - Multiple robots – limit Staph aureus cows to 1 robot
    - Limit Staph aureus cows 2x milking
    - Limit time when Staph aureus cows can milk to the 3 or 4 hours prior to a system wash
    - Include a backflush or sanitize cycle after Staph aureus cow

Milk quality - robot

- Technology requires monitoring reports
- The key to milk quality in a robot is monitoring udder health reports at least twice daily
  - 12 hours apart
  - Cows monitored in AM also monitored again in PM
  - All cows on list monitored at least twice in 24 hour period even if cow did not show up on report 12 hours later

Key reports to monitor

- Milk deviation
- Abnormal milk, separated milk
  - SCC, color, conductivity
- Fetch/Collect cows
  - Long interval and low milkings/day
- Slow or long milking time
- Fetch cows or average milkings/day
- Failed milkings
- Activity
- Rumination

- Reports
  - Collect/Fetch Cows
  - Udder health Alert or Attention Report
    - 12 hour report
  - Udder health monitoring report
    - 24 hour or repeat report
  - Failed/Incomplete milkings
  - Robot performance/daily milkings
  - Alerts from robot on main screen

Robot success

- Perform daily, weekly and monthly maintenance tasks as recommended by the manufacturer – 8 hours/week
- Monitoring reports at least 2 times daily – 3 times daily preferred
  - Cow level
  - Robot diagnostics (equipment)
- Cows will adapt quicker than people
  - Do not interfere with the flow of cattle to and from the robot
  - It's ok if a cow hasn't visited the robot in 10 hours
    - Give her a chance to visit on her own before getting her up and moving her to the robot
  - Go check her visually and if all looks well then give her a chance to move to the robot
  - Once you start moving cows to the robot it is hard to break the habit
- Evaluation/treatment area to monitor cow – not in robot
- Observe cows with limited cow to human interaction
- Barn design
- Feed

Discussion ?

- Why hasn't Joe monitored reports today? I better fetch Joe!!!

- Liner selection team member!!!