Milking Equipment 101
Huge Opportunities with Little Interest & Lots of Excuses!

Ontario AABP Meeting
Guelph Ontario

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Looking for a part time job??

TACO BELL

DRIVE THRU

NOW HIRING ALL SHITS
Fuk Mi Sushi & Seafood Buffet
A positive attitude goes a long way!
Veterinary Success

Your **only goal** to assist your farmers in succeeding.

IF they succeed, so do you!
"It is important to cure diseased animals, but even more important is - through skilled care and correct use to prevent disease!"

Erik Viborg
Danish veterinarian, 1795
DAIRY FARMERS MUST TRUSTED ADVISORS

Q10.P - Currently, how involved are the following types of consultants/advisors in your operation? (6= very involved and 1= not very involved)
Veterinary Success

Milk quality programs is one of the main areas dairy farmers are looking for assistance.
Likelihood of using herd veterinarian - ranked by producers

Q9.P - How likely would you be to go to your herd veterinarian instead of another outside paid consultant/advisor for the following services?
(6= very likely and 1= not at all likely)
Areas of producer satisfaction

Q14.P - How satisfied are you currently with your herd veterinarian's expertise in these areas?

(6=extremely satisfied and 1=not at all satisfied)
Q14.P - How satisfied are you currently with your herd veterinarian's expertise in these areas? (6=extremely satisfied and 1=not at all satisfied)
Areas of producer satisfaction (cont.)

Q14.P - How satisfied are you currently with your herd veterinarian’s expertise in these areas? (6=extremely satisfied and 1=not at all satisfied)

- Nutrition/Ration Formulation: 26%
- Production Records Evaluation: 24%
- A.I. Genetic Services: 21%
- Housing/Facilities: 20%
- Milking Systems Analysis: 18%
- Employee Training on Protocols: 16%
- Expansion Planning: 15%
Qualitative research -- #1 producer frustration

“My veterinarian is TOO BUSY to provide all of the services I would like.”
Dairy Veterinarians

Too comfortable doing what they are doing

Making too much money without making any changes!
Producer predictions for more veterinarian involvement

- Vaccination Programs: 45%
- Providing Information on New or Evolving Disease Threats: 43%
- Mastitis Control Programs: 38%
- Reproductive Programs: 37%
- Fresh Cow Programs: 36%
- Mastitis Diagnostics: 36%
- Providing Information on New Products: 34%

Q13.P - How do you believe the level of your herd veterinarian's involvement on your farm operation in the following areas will change in the next 5 years?
(More Involved, Less Involved, Remain the Same or Not Involved Now or In Future)
Dairy Veterinarians

Are often the main reason dairy farms do not succeed.

Our job is to assist, guide, and provide information, NOT dictate!
Being a veterinarian is stressful, but stress is relative!

...AND YOU THINK YOU HAVE STRESS..
Milk Quality: A World Wide Issue
QUALITY MILK IS IMPORTANT TO ALL FARMS REGARDLESS OF HERD SIZE!
This IS NOT Mastitis Control
Milk Quality Programs

The farmers are not willing to pay for our advice.

Thank GOD most veterinarians feel that way. My bank account really appreciates it.

Why do I have over 80 dairies waiting for me To visit their farms?
Milk Quality Programs

Practicing veterinarians like to complain
That they aren’t doing more quality milk work

The truth is most are too comfortable doing the
Same things day in and day out.

They just don’t have time??????
OR
They don’t want to take the time doing
Something they are not comfortable with!!!
Milk Quality Programs

Take a few seconds and write down
The milk quality veterinarians you
Know that are available to assist your
Clients with a milk quality program
Milk Quality Programs

The opportunity far exceeds anyone’s Expectations!

The income is great and better than any other Option without getting very dirty!
The Mastitis Triangle

Cow

Milker

Machine
VETERINARIAN’S SUCCESS

THE NEXT MOST IMPORTANT THING ON ALL IS TO BE ABLE TO SEE THE BIG PICTURE!
MILKING EQUIPMENT
The Most Important Machine On The Dairy Farm

The most used and abused machine on the dairy farm.

Regular evaluation is critical.

Milk time evaluation is a must!
MILKING EQUIPMENT
The Most Important Machine On The Dairy Farm

Does not come with life warranty

If the machine is the cause, all programs will fail until it is fixed!
Having the Best Milking Equipment

Is of Little Value if Milking Habits and Environment are Marginal
The Milking Machine

• Can cause high SCC
• Can cause clinical mastitis
• Can cause less milk production
Cows that milk fast, have less clinical mastitis

Cows that milk slow, have
More clinical mastitis and unhealthy teat ends
Milking Equipment Testing

Having an independent person testing milking equipment yields the best results for the dairy farmer.

THE VETERINARIAN IS A PERFECT CHOICE
The Milking Machine

A huge opportunity for the veterinarian to get involved in milk quality programs.

Must be practical or not needed
The Milking Machine

Single biggest reason milk quality programs fail for veterinarians is because they DO NOT LOOK AT THE MILKING EQUIPMENT
The Milking Machine

Over 70% of the dairies I consult on have milking equipment that has a major functional problem even though their equipment dealer found it to be normal.
The Milking Machine

There are many ways to evaluate a milking machine without having any testing equipment.
The Milking Machine

Check vacuum
Fall off test
Recovery test
Look rubber goods
Cleanliness of equipment
The Milking Machine

Check vacuum

Is there a place to check vacuum levels at the start of every milking? Are they milking blindly each time??
The Milking Machine

Fall off test
With system set up ready to milk, you take one unit and hold it with teat cups down and let it suck air. Vacuum should not drop or increase more than 0.6 inches.
Recovery test
Let in large air leak until system vacuum drops 1 inch.
Should recover to set level in 3 seconds or less with no more than 0.6 inches of override
The Milking Machine

Recovery test
Great way to evaluate variable speed pumps (load test)
Regular set at 0.6 inches to prevent spikes from hurting cows
The Milking Machine

Look rubber goods
Are milk hoses cracked or soft?
Are short air tubes torn?
Shut off valves?
Milk Hoses
Milk Hoses
Milk Hoses
Milk Hose Length

• There are very few milking systems of any type that cannot benefit from shortening milk hoses.
• Does not have any negative impact and allows for faster milking.
The Milking Machine

Cleanliness of equipment

Look at SPC, LPC, Coliform counts

Look at exterior of equipment
Milking Equipment

- Dynamic Testing
- Effective Reserve
- Other Tests
Milk System Evaluation

Cardinal Rule:

Air in, vacuum down
Remove air, vacuum up
Dynamic Testing

The only acceptable way to test a milking system is while the cows are actually milking.

All other vacuum readings are just guesses or estimations.
Vacuum Level

The vacuum level of the milking system is not important!

The vacuum level in the claw while the cow is milkings is critical!
Proper System Vacuum

No loops or restrictions in milk flow

System vacuum 13.2 in

Claw vacuum 12.5 in
Proper System Vacuum

Huge extra loop causing extra lift.

Results = Lower Vacuum

System vacuum 14.6 in
Claw vacuum 12.5 in
Dynamic Testing

If the milking system has not been tested while it is milking cows, IT HAS NOT been properly tested!
Vacuum Level

The key factor in milking speed is average claw vacuum under peak milk flow conditions
Proper Claw Vacuum

Whatever Line Vacuum it Takes to Provide 11.5-12.5 inches at the Claw During Peak Flow

The Closer to 12-12.5 inches the better!
Proper System Testing

If there are no test ports on system located at pump, regulator, pulsator line, and gauge, you know the system has not been properly tested.

Makes a great talking point or a moment to plant a seed
Milking System
Air Flow Analysis

NMC Protocol

ASAE Standards
Procedures for Evaluating Vacuum Levels and Air Flow in Milking Systems
System Evaluation
Proper Vacuum Setting

High Line 13.5 to 15 Inches*
*Without Automation

Low Line 12 to 14.0 Inches

Ideal Setting Produces a Claw Vacuum at Peak Milk Flow of 11.5 to 12.5 Inches

If Vacuum Needs to Be Adjusted, Never Change By More Than 0.5 Inches at Any Time. Change Every 4-5 Days.
System Evaluation
Vacuum Levels

* Receiver Vacuum or Top Weigh Jar
* Regulator or Sensor Portion
* Pulsator Line (Furthest from vacuum source)
* Pump Inlet Vacuum
* Check Farm Vacuum Gauge
Test Nipples
- Brass 3/16 inch Hose Barb (1/8 inch NPT)
- Plastic Screw Protector

Test Port Tools
- 11/32 inch Drill Bit
- 1/8 inch Tap
- 7/16 inch Nut Wrench
System Evaluation

Receiver Vacuum

* Top of Receiver Jar
  (Test Lid, Jar Inlet, Probe Hole)
* First Inlet of Milk Line in Parlor or stanchion Barn
* Inlet on Wash Manifold
* Top of Weight Jar
Receiver Vacuum On Milk Line Inlet
Receiver Vacuum on Wash Manifold
Regulator Vacuum = 12.7 inches
Regulator Vacuum at Remote Sensor

12.7
Regulator Vacuum
At Sentinel Mark 2
Regulator
Pulsation Vacuum = 12.7 inches
Pump Inlet Vacuum = 12.8 inches
System Evaluation
Vacuum Level Interpretation

Maximum Difference Between Regulator and Receiver Jar Vacuum Should Not Exceed 0.2 Inches. Greater Differences Would Indicate High Pressure Differences Which Restrict Controller Performance Because of Either Improper Location or Excessive Restrictions in Pipelines or Fittings Between Receiver and Regulator.
System Evaluation
Vacuum Level Interpretation

Difference Between Pump Inlet Vacuum and Receiver Jar Vacuum Should Not Exceed 0.6 Inches or 2 Kpa. Greater Differences Indicate Large Pressure Drops Caused by Small Line Sizes, Too Many Elbows, or Excessive Air Flow.

Maximum Difference Between End of Pulsator Line and Receiver Jar Should Not Exceed 0.6 Inches or 2 Kpa.
Effective Reserve

The only air flow reading
That really matters.

The amount of air actually available to cope with unplanned air admissions and maintain system vacuum within 0.6 inches.
Effective Reserve

With system under load and in milking position, you let air into system until system vacuum drops 0.6 inches.

That air flow is effective reserve
Effective Reserve

Need minimum of 35 cfm plus 1 cfm per milking unit

Smaller systems need more air flow per unit than larger systems.
Effective Reserve

Systems with larger milk hoses need more effective reserve

May need 70 cfm plus 1 cfm per unit
Effective Reserve

Systems with multiple milkers may need more Effective reserve

Two people attaching two units leaks more air than one full unit fall off
System Evaluation
Unit Fall Off Test
ER=62 CFM, 5/8” Milk Hose

One Teat Cup Off = 24 CFM (57%)
Second Teat Cup Off = 12 CFM (29%)
Third Teat Cup Off = 4 CFM (10%)
Fourth Teat Cup Off = 2 CFM (4%)
System Evaluation
Effective Reserve

Check Vacuum Level at Regulator or Its Sensor, to Determine What Change in Vacuum Was Seen by the Regulator

Should Sense a Minimum of 2/3 (0.4 Inches) of the 0.6 Inch Drop at the Receiver Jar
Manual Reserve

Airflow Capacity Potentially Available to Maintain the Receiver Vacuum Stable Within 0.6 Inches If the Regulator Could Close Completely
System Evaluation
Measure Manual Reserve

Measure at the Same Location and Under the Same Conditions As Effective Reserve but With the Regulator Out of Action

(0.6 Inches Below Receiver Vacuum)

Record CFM Manual Reserve
Disable Regulators

Tape Dome Filter

Pull Off Hose From Sensor
Disable Regulators

Sentinel Mark 1 and 2:
Must Remove Regulator and Replace with a Ball
System Evaluation

Calculate Regulator Closure

Effective Reserve
Divided By
Manual Reserve
Times 100 Equals
% Closure

Should Be 90% or Greater
Incomplete Regulator Closure

If system is properly plumbed, the regulator should sense at least \( \frac{2}{3} \) of the vacuum drop of 0.6 inches which is applied to the receiver for measurement of effective reserve. (i.e. Drops 0.4 inches)

If less than 0.4 inch change, the plumbing is not adequate for the pump capacity, the system has too much pump capacity, or the regulator is located too far from the sanitary trap.

If vacuum change at regulator is 0.4 inch or more then incomplete closure is due to an inefficient or improperly sized regulator.
<table>
<thead>
<tr>
<th>DATE TESTED</th>
<th>OPERATING SYSTEM VACUUM</th>
<th>RECOVERY TIME IN SECONDS</th>
<th>REGULATOR IN DROP VAC 0.6 IN &quot;EFFECTIVE RESERVE&quot;</th>
<th>REGULATOR OUT &quot;MANUAL RESERVE&quot;</th>
<th>REGULATOR EFFICIENCY ≥ 90%</th>
<th>GENERAL COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/08</td>
<td>14.8</td>
<td>2-3</td>
<td>48</td>
<td>48</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>2/08</td>
<td>14.8</td>
<td>2-3</td>
<td>46</td>
<td>46</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>3/08</td>
<td>14.9</td>
<td>2-3</td>
<td>45</td>
<td>46</td>
<td>97%</td>
<td></td>
</tr>
<tr>
<td>4/08</td>
<td>14.8</td>
<td>2-3</td>
<td>42</td>
<td>48</td>
<td>87%</td>
<td></td>
</tr>
<tr>
<td>5/08</td>
<td>14.8</td>
<td>2-3</td>
<td>48</td>
<td>48</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>6/08</td>
<td>14.7</td>
<td>2-3</td>
<td>48</td>
<td>48</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>7/08</td>
<td>14.8</td>
<td>2-3</td>
<td>46</td>
<td>48</td>
<td>96%</td>
<td></td>
</tr>
<tr>
<td>8/08</td>
<td>14.8</td>
<td>2-3</td>
<td>40</td>
<td>48</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>9/08</td>
<td>14.8</td>
<td>2-3</td>
<td>48</td>
<td>48</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
# REDUCING PUMP CAPACITY

## DOUBLE 30 IN ARIZONA DAIRY

<table>
<thead>
<tr>
<th></th>
<th>3 pumps</th>
<th>2 pumps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Reserve</td>
<td>180 cfm</td>
<td>238 cfm</td>
</tr>
<tr>
<td>Manual Reserve</td>
<td>501 cfm</td>
<td>296 cfm</td>
</tr>
<tr>
<td>Regulator Closure</td>
<td>36%</td>
<td>80%</td>
</tr>
<tr>
<td>Vacuum Level</td>
<td>12.8 inches</td>
<td>12.8 inches</td>
</tr>
</tbody>
</table>

**Reduced Costs:** $1,300 a month (electricity)

Plumbing changes increased closure to 96%
Regulator Location
Improper Regulator Installation

Excess Elbows

Two Independent Regulators Operating To One Sensor
Pulsation

Test Function of all pulsators by making graphs.

Results are not reliable without a graph to evaluate.
Pulsation

D phase critical to teat end health and total udder health

Need minimum of 20% or 200 milliseconds

LOADED

20 TO 40 milliseconds difference loaded
Pulsation Graphs

Pulsation: Open and Closed  NOT Milk and Rest!!
Alternating Pulsator
Alternating Pulsator
Alternating Pulsator
Alternating Pulsator
System Evaluation
Pulsator Guidelines

Pulsation Rate: Within 3 pul/min
Pulsation Ratio: Within 5%
B Phase: Minimum 30%
D Phase: Minimum 15% or 150 msec

20% or 200 msec better
Pulsation Graphs

60:40

DATA SUMMARY
Pulsation 1 (PLOT)
Rate: 59.75 PPM
Ratio: 60:40
A Phase: 10% 104mS
B Phase: 50% 437mS
C Phase: 8% 80mS
D Phase: 32% 323mS
A+B Phase: 60% 601mS
C+D Phase: 40% 403mS
Vacuum: 13.4inHg

DATA SUMMARY
Pulsation 2 (PLOT)
Rate: 59.68 PPM
Ratio: 60:40
A Phase: 11% 108mS
B Phase: 49% 498mS
C Phase: 8% 81mS
D Phase: 32% 315mS
A+B Phase: 60% 606mS
C+D Phase: 40% 399mS
Vacuum: 13.6inHg

70:30

DATA SUMMARY
Pulsation 1 (PLOT)
Rate: 60.00 PPM
Ratio: 70:30
A Phase: 12% 117mS
B Phase: 58% 579mS
C Phase: 9% 95mS
D Phase: 21% 209mS
A+B Phase: 70% 695mS
C+D Phase: 30% 304mS
Vacuum: 12.7inHg

DATA SUMMARY
Pulsation 2 (PLOT)
Rate: 60.00 PPM
Ratio: 70:30
A Phase: 11% 115mS
B Phase: 59% 581mS
C Phase: 10% 97mS
D Phase: 20% 207mS
A+B Phase: 70% 695mS
C+D Phase: 30% 304mS
Vacuum: 12.8inHg
Limp: 0%
What’s Wrong?
Pulsation Graphs

What’s wrong?
Pulsation Graphs

What’s wrong?
Pulsation Graphs

What’s wrong?
Pulsation Graphs

Normal = 60:40

<table>
<thead>
<tr>
<th>Pulsation 1 (PLOT)</th>
<th>Pulsation 2 (PLOT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate: 60.31 BPM</td>
<td>Rate: 60.37 BPM</td>
</tr>
<tr>
<td>Ratio: 55:45</td>
<td>Ratio: 49:51</td>
</tr>
<tr>
<td>A Phase: 17% 166ms</td>
<td>A Phase: 17% 167ms</td>
</tr>
<tr>
<td>B Phase: 38% 380ms</td>
<td>B Phase: 32% 318ms</td>
</tr>
<tr>
<td>C Phase: 10% 104ms</td>
<td>C Phase: 11% 111ms</td>
</tr>
<tr>
<td>D Phase: 35% 345ms</td>
<td>D Phase: 40% 398ms</td>
</tr>
<tr>
<td>A+B Phase: 55% 546ms</td>
<td>A+B Phase: 49% 485ms</td>
</tr>
<tr>
<td>C+D Phase: 45% 449ms</td>
<td>C+D Phase: 51% 509ms</td>
</tr>
<tr>
<td>Vacuum: 13.21 inHg</td>
<td>Vacuum: 13.41 inHg</td>
</tr>
</tbody>
</table>

What's wrong?
Poor Pulsator Function

NORMAL

ABNORMAL
Pulsation Graphs
Pulsation Control

Good Puls

Bad Puls
Pulsation Monitoring

Are you sure green is OK??
Malfunctioning Pulsation
Can Cause Trauma to Teat Ends
Can Cause Behavioral Change
Basic Test Equipment Needed

- Stopwatch
- Flowmeter
- Vacuum Recorder
A Stopwatch is a Valuable Piece of Test Equipment During Milk Time Visits, it Can Be Used in Many Different Ways.
Air Flow Meter


When Open Holes, Air Comes In and Vacuum Goes Down.

When Close Holes, Air is Shut Off So Vacuum Goes Up.
Air Flow Meters
Air Flow Meters
Air Flow Meters
Milk Testing Equipment
Vacuum Recording Devices

Prefer Dual Channel Recorders
Battery Operated Most Convenient
Light Weight and Durable
Milk Test Equipment
Vacuum Recording Devices

* Alfatronic IV
* Digimit
* System Analyzer
* Triscan
Vacuum Recorders
Vacuum Recorders
REMEMBER

If you don’t do the milk quality work, someone else will!
If you *always* do what you have *always* done,

You *always* get what you *always* got!
Thank You!
QUESTIONS