Preventing & Cleaning Orbeseal Residue in CIP Wash Systems

2010 Wisconsin Dairy Field Representative Conference

Keith L. Engel

GEA Farm Technologies
We must first understand:

Why do dairy producers use Orbeseal?
Infections are often acquired during the dry period.

65% of clinical environmental mastitis cases found at calving had the same pathogen isolated during the dry period.

Bradley et al, NMC ‘99

Cows with environmental pathogens isolated at dry off were 4.5 times more likely to have a new clinical case in their next lactation.

Courtesy of Pam Ruegg
Natural Teat Sealing

Very low probability of infection

Closed teat

dry cow secretions

keratin plug blocks penetration

Higher probability of infection

Open teat

dry cow secretions

Courtesy of Pfizer
Why the dry period problems – Keratin Plug Formation?

- Almost half of all teats remained open during the first week of dry off

  Over 23% remain open six weeks after dry off.


97% of clinicals occurred in ‘open’ quarters

Courtesy of Pfizer
“Orbeseal”

Internal Teat Sealant

Courtesy of Pfizer
The Orbeseal Group showed statistical significance over the Control Group by improving three economic parameters as follows:

- **20%** improvement in incidence of new infections at calving.
- **26%** improvement in clinical mastitis between dry off and 60 days in milk.
- **19%** improvement* in somatic cell count at 6-8 days in milk.

*Courtesy of Pfizer
Economic results

• Differences in the timing and frequency of the first cow case of mastitis led to an improvement in the milk available for sale prediction in the treatment group over the control group ranging from 1,418 to 7,084 Kg milk per 100 cows, with an average for all herds of 4,237 kg (9341 #s).

• The cost benefit calculation for all three herds gave a mean benefit per cow of $5.38 for Orbeseal use. For herds A and C, the benefit was $10.77 and $13.84 per cow.

• With this kind of profit on the table dairy producers are going to continue to use Orbeseal.

Courtesy of Pfizer
Keeping Orbeseal off Milk Contact surfaces

• Prevention is key.
• Proper training of milkers on administration and removal.
• Make sure that the CIP wash system is optimized and maintained.
• Always make sure the 6 requirements of CIP cleaning are met on the washing system.
• Proper slug velocity and a water flow through units is key.
• Always use a milk filter for washing and milking.
• There are products to help maintain the system, but they are not shock treatments for removal of Orbeseal.
• Sometimes manual cleaning of meters and receivers is necessary when the above has failed. It is important to use foam brushes or sponges with a manual cleaner with a lot of surfactant so that you do not scratch equipment causing future problems.
In order prevent Orbeseal residues in CIP wash systems, milk harvesters must first understand:

**HOW TO USE ORBESSEAL**

When managing dry cows, correct procedures must be followed to prevent mastitis infections. At all times, dry cow materials should be kept away or shielded from possible fecal/urine contamination. Disposable gloves should be worn during the disinfection process. Orbeseal should be stored at room temperature (60°-85°F, 15°-30°C). If Orbeseal becomes difficult to administer in extremely cold weather, it should be warmed to room temperature. Individual tubes should not be immersed in water. The Orbeseal bucket can be lowered into a five-gallon bucket filled with warm water to warm the tubes.
Proper administration of Orbeseal at Dry Off

1. Teats should be clean and dry. If teats are not clean, CAREFULLY wash and dry them prior to disinfection.

2. Using an alcohol pad, physically clean the end of the teat to remove any contaminated skin, dirt or mucous. Repeat until the pad remains clean.

3. Disinfect the far teats before the near teats to avoid accidental contamination of previously disinfected teats.

4. Insert the Orbeseal syringe nozzle into the teat canal, grasp the base of the teat near the udder attachment with two fingers pressed firmly together and slowly inject all contents. Use one complete syringe per quarter. Do not massage. Orbeseal must remain in the teat canal to be effective.

5. Insert Orbeseal into the nearest teats first to minimize contamination of teats that have not been treated.

6. After inserting Orbeseal, mark the cow so others can tell she has been dried off. Then dip each teat with a quality teat dip.

Courtesy of Pfizer
Proper Removal of Orbeseal at Freshening

TO REMOVE ORBEOSEAL, PERFORM THE FOLLOWING STEPS:

1. To effectively strip Orbeseal, be sure to grab the top of the teat–where it meets the udder–and work all the way down. Don’t grab the middle of the teat, squeeze, and work down. This will only clear the bottom half of the teat. Strip the entire quarter by starting at the top and working all the way down.

2. Strip aggressively–10 to 12 times per quarter–for the first 4 days post-freshening. This helps to ensure that you’re removing the plug and all Orbeseal particles.

3. Milk into a bucket for the first 3 to 4 days post-freshening. This will help to remove any remaining Orbeseal particles.

Training and re-training of milkers on stripping fresh cows treated With Orbeseal should be done to remove it optimally. Courtesy of Pfizer
Picture taken in a fresh cow group just before milker unit attachment.
Observation of CIP Procedures

• Evaluate if CIP procedures are being followed correctly.
• Always consider the 6 requirements of cleaning when troubleshooting any build-up.
• Check temperature monitoring devices.
• Measure chemical concentrations.
• Record temperature of the water returning to the wash sink at the beginning and end of each cycle.
• Complete a sketch of the CIP system and flow circuit to document conditions for future reference and consultation.
Requirements for C.I.P. Cleaning

- Time
- Temperature
- Water Volume
- Chemical Balance
- Velocity
- Drainage
Adequate chemical levels, drainage, and temperatures.

<table>
<thead>
<tr>
<th>PIPELINE Wash Evaluation</th>
<th>Current Product</th>
<th>Initial Recommendation</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) PRE WASH RINSE</td>
<td>Optimum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Rinse is started how many minutes after milking</td>
<td>A.S.A.P.</td>
<td>minutes</td>
<td>120 feet of 3&quot; Milk line &amp; 50 gallon receiver jar. Current On Time = 4.97 Off. Time = 14.43. 10% between 1st and last test points.</td>
</tr>
<tr>
<td>b) Starting temperature.</td>
<td>95 - 110 F (40 - 70 C)</td>
<td>minutes</td>
<td></td>
</tr>
<tr>
<td>c) Is water diverted to drain?</td>
<td>Yes</td>
<td>minutes</td>
<td></td>
</tr>
</tbody>
</table>

2) Wash Cycle

<table>
<thead>
<tr>
<th>a) Ounces of detergent used. Powder [ ] Liquid [x]</th>
<th>b) Starting temperature. 160 F / 60 C</th>
<th>c) Circulation time. 10 minutes</th>
<th>d) Discharge temperature. 120 F / 50 C</th>
</tr>
</thead>
<tbody>
<tr>
<td>e) Wash solution pH. 10 - 11.5 pH minimum</td>
<td>f) Active alkalinity. 250-350 ppm</td>
<td>g) Active chlorine. &gt;500 ppm for meters 100-125 ppm minimum</td>
<td></td>
</tr>
</tbody>
</table>

3) ACID RINSE

<table>
<thead>
<tr>
<th>a) Ounces of acid used.</th>
<th>b) Starting temperature. 95 - 110 F or Cold with hot fix/week</th>
<th>c) Circulation time. 5 minutes</th>
<th>d) Acid solution pH. 2.0 - 3.5 pH optimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>e) Is acid rinse performed after each wash? Yes/No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4) Sanitize Cycle

<table>
<thead>
<tr>
<th>a) Ounces of sanitizer used. Powder [ ] Liquid [x]</th>
<th>b) Minutes cycle performed before milking. 30 minutes</th>
<th>c) Starting temperature. 95 - 100 F.</th>
<th>d) Circulation time. 5 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>e) Active chlorine.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chlornex</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes/No</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

| Gallons/inch | **Temperature Chart read 148 degrees F. This is a benchmark of what temperature your recorder must be or higher to have an adequate wash. |
C.I.P. Wash Cycles

Pre – Wash Rinse

- No chemical
- Circulate and divert
- Starting temperature: 95 – 110°F (35-43°C)

**Purpose:**

- Removes some soil load - Up to 98%
- Warm the equipment surface
C.I.P. Wash Cycles

Wash Cycle

- Chlorinated alkaline cleaner
- Circulate 8-10 minutes (Make sure to have a minimum of 20 “GOOD SLUGS” in wash cycle!)
- Starting temperature: 160°F (70°C)
- Discharge temperature: 120°F (50°C)
- Wash solution pH: 10 – 11.5 (minimum)
- Active alkalinity: 250 – 350 ppm (minimum) Higher depending system size & run time.)
- Active chlorine: 75 – 100 ppm (minimum)

Purpose: Removes Milk Fat, Protein and Minerals.
C.I.P. Wash Cycles

Acid Rinse

- Acid Rinse
- Circulate 5 minutes
- Starting temperature: 95 – 110°F (35-43°C)
- Acid solution pH: 2.5 – 3 (optimum)

**Purpose:**
- Removes chlorine/detergent residues
- Remove minerals
- Inhibits bacteria growth
- Increase chemical activity
C.I.P. Wash Cycles

Sanitize Cycle

- Sanitizer (EPA registered product)
- Run cycle 30 minutes before milking
- Circulation time: 5 minutes
- Starting temperature: 95 – 100°F (35-38°C)
- Active chlorine: 100 – 200 ppm (optimum)

Purpose: Kill bacteria
# C.I.P. Wash Cycles

## Detergents - Basic Ingredients
- Alkalinity emulsifies fats.
- Chlorine peptizes Proteins.
- Sequestration Agents tie up Solids and carry them out.

## C.I.P. Cleaning Requirements
- Time
- Temperature
- Volume
- Chemical Balance
- Velocity
- Drainage

## C.I.P. Cleaning Cycles
- Pre-Wash Rinse
- Wash Cycle
- Acid Rinse
- Sanitize Cycle
Most Common Causes of C.I.P. Cleaning Problems

- Mechanics
- Water Temperature
- Water Quality
- Detergent Dosage/rate
- Milking Hygiene

Optimize Washing – Slug size & Speed
• **Slug Volume and Size**
  - **Too Large**
    - Increases use of chemical and water
    - Improper volume may admit unwanted air into the system through the wash tank
    - Causes the Milk Receiver to Flood
  - **Too Small**
    - Improper Volume may not allow slug to travel through the system
    - Components will not clean
<table>
<thead>
<tr>
<th>Setup Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Slug setup</td>
<td>Single slug</td>
</tr>
<tr>
<td>Slugs per cycle</td>
<td>30</td>
</tr>
<tr>
<td>Slugs per minute (range)</td>
<td>3-6</td>
</tr>
<tr>
<td>Min slug size for 3&quot;</td>
<td>4 gal or 1/4 rec</td>
</tr>
<tr>
<td>Min slug size for 4&quot;</td>
<td>12 gal or 1/4 rec</td>
</tr>
<tr>
<td>Gals per unit</td>
<td>7</td>
</tr>
<tr>
<td>Receiver size</td>
<td>1 gal/unit</td>
</tr>
<tr>
<td>Slug speed</td>
<td>30 ft/sec</td>
</tr>
<tr>
<td>Air injector</td>
<td>Milk line only</td>
</tr>
</tbody>
</table>
Make sure you have even flow of wash solution through all units.
“Blow By”

Figure 9: Moving the location of the injector may correct a blow-by
Vacuum Levels Equal on both channels

80 feet (24 Meters) divided by 2.75 seconds equals 29 feet/second (8.8 Meters)

Travel Distance divided by time equals feet/meters per second

One vertical division on graph equals one second
Identification

• 1) Do not assume that it is always Orbeseal just because the film is white.

• 2) Always observe whether the 6 requirements of cleaning are being met.
  • Time
  • Temperature
  • Water Volume
  • Chemical Balance
  • Velocity
  • Drainage

• 3) Use identification chart and perform chemical test to help in your identification.

• 4) Know what Orbeseal feels like right out of the tube.
## Troubleshooting Guide to Common Cleaning Problems

<table>
<thead>
<tr>
<th>FILM/DEPOSIT</th>
<th>IDENTIFICATION</th>
<th>PROBABLE CAUSE(S)</th>
<th>REMOVAL</th>
<th>PREVENTION</th>
<th>FYI...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fats</strong></td>
<td>Heavy deposit produces soft yellow film - Light buildup dulls surface and causes water to bead - &quot;Greasy&quot; appearance</td>
<td>Improper pre-rinse (cold water temperature - Weak alkalinity detergent solution (pH below 10.5) - Low initial or distal water temperature - Rinsing only; not washing after each milking - Using acid washes only - Improper drainage</td>
<td>Mix chlorinated alkaline detergent at twice the recommended dosage and add liquid or powdered chlorine at 1 oz. for each 5 gallons of wash solution - For manual brush surfaces, prepare a paste of 4 oz. of chlorinated alkaline detergent + 1 oz. liquid chlorine - Pour on surface and allow to stand for 2 minutes - Brush thoroughly - Rinse - Repeat as necessary</td>
<td>Analyze water and prescribe proper detergent at proper concentration - Ensure pH above 10.5 and temperature above 120°F (70°C) at the end of the cycle - Check for proper wash volume, velocity, contact time and drainage - Ensure that the proper water temperature is obtained during the pre-wash rinse [95-110°F (35-43°C)]</td>
<td>Alkaline reagents contained in the detergent will combine with the milk fat, breaking it down to form soap. This process is called saponification.</td>
</tr>
<tr>
<td><strong>Proteins</strong></td>
<td>Heavy buildup produces yellow varnish-like appearance or slimy gelatinous film like applesauce - Light buildup will give a blue or rainbow cast to stainless steel. Causes water to bead</td>
<td>Use of non-chlorinated detergent or detergent low in chlorine (chlorine level below 60 ppm) - Rinsing only; not washing after each milking - Using acid washes only - Improper pre-rinse (hot water temperature - Improper drainage)</td>
<td>Mix chlorinated alkaline detergent at twice the recommended dosage and add liquid or powdered chlorine at 1 oz. for each 5 gallons of wash solution - For manual brush surfaces, prepare a paste of 4 oz. of chlorinated alkaline detergent + 1 oz. liquid chlorine - Pour on surface and allow to stand for 2 minutes - Brush thoroughly - Rinse - Repeat as necessary</td>
<td>Analyze water and prescribe proper detergents at proper concentration - Ensure proper pH, solution temperature, volume, velocity, contact time and drainage - Check for proper rotation and/or storage of chlorinated alkaline detergent - Ensure that the pre-wash rinse is performed with the correct water temperature [95 (35°C) – 110°F (43°C)]</td>
<td>Chlorine in a chlorinated alkaline detergent &quot;pep-tizes&quot; or breaks down protein and converts it to a more soluble form that can be carried out through the wash system.</td>
</tr>
<tr>
<td><strong>Hardness Minerals</strong></td>
<td>Chalky – white to gray water spots and film and “Blush” cast to stainless steel</td>
<td>Use of detergent with inadequate sequestering capacity to “tie up” minerals during washing - Not acid rinsing after each milking - Not employing alternate acid wash</td>
<td>Mix acid cleaner at recommended dosage in 140°F (60°C) water - Circulate for a minimum of 10 minutes - Repeat as necessary</td>
<td>Analyze water and recommend a water softener to remove hardness minerals - Use detergent high in sequestering capacity - Use acidification rinse after each milking - Ensure acid rinsing in temperatures below 120°F (49°C)</td>
<td>Hard water used in the cleaning system is the leading cause of increased supply bills. More detergent is needed to remove buildup.</td>
</tr>
<tr>
<td><strong>Milkstone</strong></td>
<td>Heavy build up produces hard white or yellow film</td>
<td>Compounded soil of minerals and milk soils usually caused by excessive water hardness or inadequate sequestering activity of detergent - Not using acidification rinse after each milking</td>
<td>Mix acid cleaner at three times recommended dosage in 140°F (60°C) water - Circulate 10 minutes - Follow with chlorinated alkaline detergent wash - Repeat acid wash in 95-110°F (35-43°C) water</td>
<td>Analyze water - Recommend water softener to remove hardness - Use acid rinse after each milking - Use acid wash as substitute for chlorinated detergent periodically</td>
<td>Sequestrants in detergents “latch-on” and “tie-up” minerals and carry them out of the pipeline before they can redeposit.</td>
</tr>
<tr>
<td><strong>Iron</strong></td>
<td>Reddish-brown to almost black stain on equipment</td>
<td>Iron in water supply precipitating due to oxidation to ferric iron - Use of liquid chlorine as sanitizer causes oxidation and precipitation of iron - Use of detergent with inadequate concentration to compensate for iron in water supply</td>
<td>In cases of severe staining, use iron remover (sodium hydrosulfite) at 1 oz. per gallon in warm 120°F (49°C) water - Circulate 10 minutes - Use acid cleaner at 1-2 oz. per gallon of solution in 140°F (60°C) water - Circulate 10 minutes</td>
<td>Analyze water - Recommend water softener and/or iron filter depending on ppm of iron in water supply. Use daily acid rinse after each milking</td>
<td>1 ppm of Iron is equal to 70 ppm of water hardness or 4 gpg and should be accounted for when analyzing the hardness of the water.</td>
</tr>
</tbody>
</table>

**Be sure all recommended acid rinses reach a pH of less than 3.5 in order to be fully effective in removal of the film/deposit.**

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# Troubleshooting Guide to Common Cleaning Problems

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<th>PROBABLE CAUSE(S)</th>
<th>REMOVAL</th>
<th>PREVENTION</th>
<th>FYI...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minerals</td>
<td>Powdery white film</td>
<td>Rinsing with plain water in excess of 140°F (60°C) causing rapid evaporation of water on surfaces</td>
<td>Mix acid cleaner 1 oz. per gallon and circulate 10-20 minutes in 120°F (49°C) water - For manual surfaces, brush thoroughly with acid cleaner</td>
<td>Increase dilution rate of acid rinse as necessary - Reduce water temperature to 95-110°F (35-43°C)</td>
<td>While minerals are inorganic soil, they still provide nutrients and a home for bacteria.</td>
</tr>
<tr>
<td>Blacking/Inking Smears</td>
<td>Black residue from degraded rubber goods - smears or smudges when touched</td>
<td>Sanitizing with excessive amounts of chlorine - Excessive amounts of chlorine in detergent solution - Failure to acid rinse after each milking</td>
<td>Mix acid cleaner at 1 oz. per gallon and circulate 10-20 minutes in 140°F (60°C) water - Use an acid product containing surfactant such as WS’s LAC™</td>
<td>Ensure proper amounts of chlorine sanitizer</td>
<td>Chlorine accelerates normal rubber degradation, but is a necessary bacteria killer.</td>
</tr>
<tr>
<td>Blacking/Inking Stains</td>
<td>Black or brown stain on stainless steel - does not smear or smudge when touched</td>
<td>Contact with excessive amounts of alkalinity and chlorine - Over a prolonged period of time</td>
<td>Permanent damage - Repolish or replace stainless</td>
<td>Ensure proper mixing and complete solubility of caustic products.</td>
<td>Always follow label instructions for safety and proper product use.</td>
</tr>
<tr>
<td>Silica</td>
<td>White to gray glazed appearance</td>
<td>Use of mechanical cleaner for manual cleaning - Poor rinsing - Water supply - Failure to manually clean outside surface of equipment cleaned inside mechanically</td>
<td>There is no safe way to remove silica deposits - Pipelines heavily coated with Silica may need to be replaced</td>
<td>Use of a high phosphate chlorinated powder helps to prevent further build-up.</td>
<td>Over 30 ppm of silica in the water supply has the potential to leave unremovable deposits.</td>
</tr>
<tr>
<td>Barium Sulfate</td>
<td>Hard to remove white film - Uneffected by normal acid contact</td>
<td>Barium in the water supply</td>
<td>Shock treatment with WS’s Big Rid™</td>
<td>Use of a water softener will remove barium from the water supply and prevent deposit reformation</td>
<td>Neither acid or alkaline affects barium sulfate.</td>
</tr>
<tr>
<td>Factory Soil</td>
<td>Grease, factory dirt, black deposit, rusting</td>
<td>Improper or no initial cleanup</td>
<td>Initial cleanup</td>
<td>Thorough cleaning before equipment is used initially</td>
<td>Routeman should initiate this.</td>
</tr>
<tr>
<td>Corrosion</td>
<td>Rusting or pitting</td>
<td>Iron - Metal particles - Improper chemical usage - Concentrated chlorine sanitizing solution leaks into bulk tank</td>
<td>Acid wash and abrasive action - Repolishing if bad corrosion or replacement of stainless steel</td>
<td>Proper procedures with a phosphate based acid rinse</td>
<td>All WS acids are phosphate based.</td>
</tr>
<tr>
<td>Etching</td>
<td>Pitted and white discoloration &quot;imbedded&quot; in stainless steel surface</td>
<td>Use of improper chemicals - Incorrect application of chemical</td>
<td>Repolish or replace stainless steel</td>
<td>Proper procedures with a phosphate based acid rinse</td>
<td>All WS acids are phosphate based.</td>
</tr>
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**Be sure all recommended acid rinses reach a pH of less than 3.5 in order to be fully effective in removal of the film/deposit.**
### ID of Build-up Using NMC Troubleshooting Procedures

<table>
<thead>
<tr>
<th>Location</th>
<th>Color</th>
<th>Texture</th>
<th>Acid Soluble</th>
<th>Detergent Soluble</th>
<th>Chlorine Soluble</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiver</td>
<td>White</td>
<td>tacky</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Neck of Receiver</td>
<td>Yellow/White</td>
<td>Slimy</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Receiver Gasket</td>
<td>Yellow/White</td>
<td>Slimy</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Gaskets by Milk Pump</td>
<td>Yellow</td>
<td>Slimy</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Orbeseal
Not Orbeseal

2/8/2010
Not Orbeseal
Not Orbeseal
Orbeseal

9/10/2009
Not Orbeseal
Not Orbeseal
Orbeseal
Not Orbeseal
Not Orbeseal
Orbeseal
Not Orbeseal
Keeping Orbeseal off Milk Contact surfaces

• Prevention is key.
• Proper training of milkers on administration and removal.
• Make sure that the CIP wash system is optimized and maintained.
• Always make sure the 6 requirements of CIP cleaning are met on the washing system.
• Proper slug velocity and a water flow through units is key.
• Always use a milk filter for washing and milking.
• There are products to help maintain the system, but they are not shock treatments for removal of Orbeseal.
• Sometimes manual cleaning of meters and receivers is necessary when the above has failed. It is important to use foam brushes or sponges with a manual cleaner with a lot of surfactant so that you do not scratch equipment causing future problems.
If you have to manually clean Orbeseal, do not use anything abrasive. Foam paint brushes work great for meters and a foam car wash sponge for receivers with a high surfactant manual cleaner.
Thank-you for your time!
Thank-you!

Keith L. Engel
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GEA Farm Technologies