Which Chemicals to Use for Water Line Maintenance

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Areas We Will Discuss

1. Why So Important?
2. What is Currently being used.
3. How Various Products are Being Used.
4. New Products and Methods of Applying Chemicals
Why Is It So Important?

- Part of Best Management Practices or “BMP’s”.
  - Guidelines to follow to sell your birds.
  - Public pressures are starting to dictate this.
- Better Starts for Birds.
  - Birds are different today compared to a few years ago.
  - These birds are selected for faster growth and higher yields. Immune systems probably not be as strong.
- What’s in it for you?
  Better overall Performance for increased pay!
  - Less Mortality, better growth, and better feed conversions. (Lower Cost Per Pound of Meat)
  - Less need for antibiotics.
Problems Caused by Poorly Maintained Water Lines

1) Antibiotics and vaccines are not as effective.

2) Supplements such as vitamins and electrolytes are not as effective.

3) An added stress that could cause birds to develop illness.

4) Birds don’t perform to their potential. (Lower weight gains and Higher Feed Conversion)
### Aerobic Bacteria in Water

**3 Farm Comparison at the Source and the End of the Line**

<table>
<thead>
<tr>
<th>Farm</th>
<th>CFU/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-- At source</td>
<td>2,700</td>
</tr>
<tr>
<td>1-- At end of line</td>
<td>26,600</td>
</tr>
<tr>
<td>2-- At source (community)</td>
<td>203,000</td>
</tr>
<tr>
<td>2-- At end of line</td>
<td>2,340,000</td>
</tr>
<tr>
<td>3-- At source</td>
<td>0</td>
</tr>
<tr>
<td>3-- At end of line</td>
<td>4,775,000</td>
</tr>
</tbody>
</table>
Biofilms

- Composed of microbial communities encase themselves in an extracellular polysaccharide (we know it better by slime).
- Organisms attach to smooth surface.
Biofilms

• Trap nutrients where bacteria can survive.
• Survives on nutrient levels we can’t detect.
• Their development is most rapid in flowing systems where adequate nutrients are available. (Nipple Drinker Systems)
• Can return within 2-3 days after sanitation.
Bio film is the breeding ground where microorganisms easily multiply. Microorganisms within the bio film are protected from antibacterial agents.
What is Being Used Now?

• Bleach – Both liquid (Sodium Hypochlorite) and dry (Calcium Hypochlorite)
• Hydrogen Peroxide
• Various Acids
  – Citric Acid
  – PWT (Sodium Bisulfate)
  – Hydrochloric Acid (Muriatic Acid)
  – Acidified Copper Sulfate
  – Various Blended Acids
Bleach - the Most Commonly Used Water Sanitizer

• Just because you are using bleach, does not mean you are using it effectively.

• Most use chlorine test kits to tell ppms at the end of the water line.
  – Too strong could back birds off water.
  – Too weak could be ineffective in kill.

• Bleach or Chlorine may not be your most effective option.
Chlorine treatment

Chlorine only eliminates “free” bacteria

Bacteria which are still present after treatment with chlorine
Chlorine and Hypochlorous Acid

- Chlorine is not effective until it dissolves and produces Hypochlorous acid.
- Hypochlorous acid is 80 times more effective as a sanitizer than hypochlorite ion.
- Free chlorine not considered effective unless it is 85% Hypochlorous acid.
- Having the correct pH to get optimum results.
How pH Affects Ratio of Hypochlorous Acid to Hypochlorite Ion

% In Solution

pH of Water

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What you Need to Know if you are going to use bleach.

–Be around a pH of 6 to have impact on bad organisms.
Problems with Chlorine

- Very unstable. Gases off easily.
  - Even sitting in a sealed container problems such as short self life and temperature can cause your product to decrease in strength.
  - Sunlight and temperature have a great impact.
  - Using large containers or high percentages of bleach is not a great idea.

- Acidifying Chlorine can be very dangerous due to the gassing effect.
Careful with the bleach!
Oxidation-Reduction Potential

• Measures the energy in water, or the conductivity of the water.

• If free chlorine is present- energy will be high. Greater than 600.

• Dirty water or has no free chlorine, has a low amount of energy.

• Optimum ORP level for Chlorine - 650 to 750.
  — Free chlorine levels of .2 to .4 ppm adequate.

• ORP levels will differ from product to product. Chlorine Dioxide or Hydrogen Peroxide will have different values for effective levels.
What to Measure
ORP or Chlorine?

<table>
<thead>
<tr>
<th>pH</th>
<th>ORP</th>
<th>Total Chlorine</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.69</td>
<td>560</td>
<td>3</td>
</tr>
<tr>
<td>6.49</td>
<td>590</td>
<td>3</td>
</tr>
<tr>
<td>6.37</td>
<td>605</td>
<td>3</td>
</tr>
<tr>
<td>5.93</td>
<td>630</td>
<td>3</td>
</tr>
</tbody>
</table>

Added PWT stock solution in .5 ml increments to dd H2O by Susan Watkins
Some Use Acids for Waterlines and Bird Health

- Citric Acid, PWT, Aquavite, EmaSol, Performax, Acidified Copper Sulfate, and a ton of others.
- Certain Acids make it difficult for most bad bacteria to thrive if kept below 4 pH.
- Depending on what acids are used, pH alone does not tell you how effective it is. However, it is generally a good rule of thumb.
## Effect of pH Alone on Bacterial Growth

<table>
<thead>
<tr>
<th>pH</th>
<th>E. coli</th>
<th>Salmonella</th>
<th>Clostridium</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4</td>
<td>++++</td>
<td>++++</td>
<td>++++</td>
</tr>
<tr>
<td>6.0</td>
<td>+++</td>
<td>+++</td>
<td>++++</td>
</tr>
<tr>
<td>5.8</td>
<td>++</td>
<td>++</td>
<td>++++</td>
</tr>
<tr>
<td>5.4</td>
<td>+</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>5.0</td>
<td>-</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>4.5</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>4.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Roney et al., Alabama. The more + the better the bacteria grows.
Use of Acids – Disadvantages

- Disadvantages – For using as a cleaner
  - At constant low pH (around 4 or lower) can be very corrosive.
  - Acids seem to allow build up to break away in chunks and stop nipple drinkers from working properly at times.
  - Doesn't give a complete kill of bacteria, fungus and viruses.
  - In some cases will help algae or fungus grow. It thrives in lower pH’s (4-6)
New Technology for Waterline Maintenance

• Stabilized and Non Corrosive Oxidizers. Works on Biofilms and safe for drinking water.

  ✓ Anthium Dioxide – A 5% Stabilized Chlorine Dioxide
  ✓ Proxy Clean – 50% Stabilized Hydrogen Peroxide plus Silver Nitrate.
  ✓ Chlorine Dioxide Sachets
Proxy Clean

- 50% Stabilized Hydrogen Peroxide plus Silver Complex.
- Can be used between flocks and during grow out period.
- Very Effective in dealing with bioslimes.
- Low Corrosivity
- Removes and Prevents Bioslimes
- Oxidizers prevents Bacteria Growth
Proxy Clean

• Why Stabilized and buffered 50% hydrogen peroxide with Silver Complex is important?
  – Buffered = less corrosive to equipment
  – Stabilized = will not loose strength as quickly.

• Generally breaks down Algae bloom or slime without stopping up drinkers. Basically destroys Bioslimes.

• How Used
  – Birds present - 1.66oz/gallon stock.
  – No Birds – straight out of container or as high as 3%.

• Used in Europe in human municipal water systems.
The Difference in Hydrogen Peroxides

Proxy-Clean: Effective in removing biofilm
Growth after 48 hours

- Escherichia coli
- Salmonella enteritidis
- Salmonella Typhimurium
- Staphylococcus aureus
- Pseudomonas aeruginosa
- Ornithobacterium rhinotracheale
## Proxy Clean Low Corrosivity

**Corrosion:**
Effect on galvanised steel drinking-water pipelines after contact with a 3% solution of the different cleaning products.

<table>
<thead>
<tr>
<th>Product</th>
<th>Dissolved Zn (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proxy-clean™, Hydrogen peroxide + Silver complex</strong></td>
<td>99</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>1100</td>
</tr>
<tr>
<td>Peracetic acid</td>
<td>2100</td>
</tr>
<tr>
<td>Chlorine</td>
<td>1200</td>
</tr>
</tbody>
</table>

*Source: BCO Analytical Services, Sterlab certified laboratory. The Netherlands*
Chlorine Dioxide Sachets
Chlorine Dioxide Sachets

Two packs are used in conjunction with one another to produce chlorine dioxide.

– One bag contains sodium chlorite.
– The second bag contains an acid.

• As the sodium chlorite breaks down in the acidic solution, chlorine dioxide is produced.
• This will give a lot of variability due to how the product breaks down in solution.
• Chlorine Dioxide is very effective on bacteria, molds, and viruses.
Anthium Dioxide by Dupont

- Effective on Iron.
- No strong taste.
- Takes out odors like sulfur water.
- Effective on Bioslim buildup in drinkers.
- Used in Human Drinking Water.
Anthium Dioxide (DuPont)

• Stabilized 5% Chlorine Dioxide (Sodium Chlorite).
  ✓ Mixed Stock solution is stable for at least 7 days.
  ✓ Not corrosive like bleach, commercial peroxide, or acids.
  ✓ Run 1-5ppm and can be measure with test strips.
  ✓ Unique selective oxidation.
  ✓ Will not have ORP readings like bleach unless an acid is added.
Let’s Compare the Advantages and Disadvantages of the Old and New Products Available.
Bleach /Chlorine-
Sodium and Calcium Hypochlorite

• **Benefits**
  – Very Cheap.
  – Kills bacteria, virus, and molds in the actual water.
  – Readily available in every Wal-Mart or Grocery Store.

• **Disadvantages**
  – Unstable. If you smell it, you have lost it. Even sitting in bottle, product will escape.
  – Very corrosive.
  – Inactivated quickly in organic material.
  – Can back birds off water.
  – Has no poultry water label.
Commercial 35% Hydrogen Peroxide

• **Benefits**
  – Good oxidizer.
  – Deals with Bioslims.
  – Effective on most bacteria, viruses, and fungi.
  – Breaks down Algae bloom to pass through drinkers.
  – Common availability in a lot of farm stores.

• **Disadvantages**
  – Not as user friendly as some less effective products.
  – Corrosive.
  – Not stable. Lose effectiveness quickly.
  – Has no poultry water label.
Proxy Clean
Stabilized & Buffered Hydrogen Peroxide

- **Benefits**
  - Very Good Oxidizer.
  - Deals with Biofilms.
  - Very Effective on Viruses, Bacteria, and Fungi.
  - Breaks down Algae blooms to pass through drinkers.
  - Has poultry water label.
  - Non Corrosive.

- **Disadvantages**
  - Not available in the local Wal-Mart or Grocery store.
  - Not as user friendly as some less effective products.
Chlorine Dioxide Sachets

**Advantages**
- Ease of Use
- Can use Medicator
- Highly effective on
  - Bacteria
  - Viruses
  - Molds
- Effective in a pH of 3-9
- Doesn’t back birds off water.

**Disadvantages**
- Can be very hazardous if the gases are inhaled.
- Currently not labeled for poultry. (EPA)
- Amount of Chlorine Dioxide can’t be regulated to the birds.
- Product ppm’s fluctuate.
Anthium Dioxide  
Stabilized Chlorine Dioxide

• **Benefits**
  – Stable at least 7 days mixed on the farm.
  – Selective Oxidation.
  – Comes in a liquid.
  – Easy to handle.
  – Not corrosive.
  – Works on Biofilms and Iron.
  – Works in pH from 3-10.
  – Has poultry water label.

• **Disadvantages**
  – Not available in the local Wal-Mart or Grocery store.
  – Doesn’t kill certain algae or fungus without low ppm’s of bleach or being activated by an acid.
Methods of Application – Medicator

• **Advantages**
  – Most farms have them.
  – Relatively Cheap
  – Can be found easily.

• **Disadvantages**
  - Not adjustable
  - Stock Mixing Still Involved
  - Not always reliable
Methods of Application – Injectors

• **Advantages**
  – No mixing involved
  – One can treat multiple houses
  – Very precise and reliable
  – Easily Adjusted
  – More than one product can be injected. Add a pH adjustment.

• **Disadvantages**
  - More expensive than medicators.
Injectors on Farms
Preferred Program

• **Step 1** Run Higher Levels and allow to sit for 48 hr between flocks with no birds.
  – Proxy Clean – up to 3% in drinking lines
  – Anthium Dioxide with activator (acid) – 400ppm
  – Then flush lines with clean water.

• **Step 2** Use a continual maintenance program during the flock.
  – Anthium Dioxide (Sodium Chlorite)
  – Chlorine Dioxide Sachets
  – Proxy Clean (Stabilized Hydrogen Peroxide)
Side Note - Looking at pH

• Birds don’t generally like to drink higher pH. They can taste salts and bitter tastes which lower water consumption.

• If you have a pH above 7.0, it is recommended to lower pH for overall better performance. 5.8-6.2 is optimum.

• Using injectors allow you to add multiple chemicals. Disinfection properties as well as a pH adjustment has been extremely successful!
Always Think Safety First

- Use any protective clothing as instructed. Gloves, safety glasses, etc.
- Use as instructed by the label.
- Keep a Material Safety Data Sheet (MSDS) available.
Thank you

Any Questions?

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