Maintenance of Drip Irrigation Systems (and *maybe* a little about Fertigation)

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Maintenance of Drip Systems:

http://anrcatalog.ucdavis.edu
Emitters:

Clogging is the greatest “threat” to emitters.
Clogging of Microirrigation Systems

Source: Physical Clogging - Particulates
Clogging of Microirrigation Systems

Source: Physical Clogging - Particulates

Solution: Filtration
Filters:

- Screen, disk, and sand media filters are all available.

- They can all filter to the same degree
  BUT
  they req. different frequency of cleaning.
Mesh size: follow manufacturer’s recommendation
Clogging of Microirrigation Systems

Source: Biological Sources
Clogging of Microirrigation Systems

Source: Biological Sources

Solution: Filtration (usually media filters) + Biocide
Biological Clogging

Acid may deter but not eliminate

biocide

chlorine  copper
Chlorine

Sources:
- Liquid - sodium hypochlorite.
- Solid - calcium hypochlorite.
- Gas chlorine.
Chlorine:

- **Sources:**
  - Liquid - sodium hypochlorite.
  - Solid - calcium hypochlorite.
  - Gas chlorine.

- **When add chlorine source to water:**
  - Forms hypochlorous acid + hypochlorite.
  - Hypochlorous acid is more powerful biocide.
  - If pH is lower (acidic), more hypochlorous acid is present - better biocide.
pH Effect on Hypochlorous Acid Concentration

Hypochlorous Acid Concentration (%) vs. pH

<table>
<thead>
<tr>
<th>pH</th>
<th>Hypochlorous Acid Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>90%</td>
</tr>
<tr>
<td>6</td>
<td>80%</td>
</tr>
<tr>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>8</td>
<td>60%</td>
</tr>
<tr>
<td>9</td>
<td>50%</td>
</tr>
<tr>
<td>10</td>
<td>40%</td>
</tr>
</tbody>
</table>
Chlorine as a Biocide

Free Chlorine

Prevent growth (continual)  1-2 ppm*
Period injection            10-20 ppm*

* Measured at the end of the last lateral

Test for chlorine using a pool / spa test kit
Chlorine: Injection Rates

- Sodium hypochlorite (liquid)
  - Example: household bleach w/ 5.25% active chlorine.

Chlorine injection = System flow x Desired Cl x 0.006 ÷ Strength of rate (gal/hr) rate (gpm) Conc. (ppm) Cl soln (%)

- Calcium hypochlorite (solid)
  - 65-70% available chlorine.
  - 12.8 lbs. of calcium hypochlorite added to 100 gallons of water forms a 1% solution.
  - Use above formula.
Chlorine: Injection Rates

- Gas Chlorine

\[
\text{Chlorine Injection} = \text{System Flow} \times \text{Desired Cl} \times 0.012
\]

Rate (lbs/day) \quad Rate (gpm) \quad Conc. (ppm)
Clogging of Microirrigation Systems

Source: Chemical Precipitates

- Lime (calcium carbonate) and iron are the most common problems.
Chemical Precipitate Clogging of Microirrigation Systems

Water quality levels of concern:

- Calcium: pH > 7.5 and 2.0 meq/l (120 ppm) of bicarbonate
Clogging of Microirrigation Systems

Source: Lime

Solution: pH Control (Acidification) + filtration
Common Maintenance Tasks:

1. Replace pressure gauges
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2. Check filter media
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3. Check pressure regulating valves
Common Maintenance Tasks:

1. Replace pressure gauges
2. Check filter media
3. Check pressure regulating valves
4. Check for leaks
Flushing of microirrigation systems:

- Silts and clay particles pass through even the best filters.
Flushing

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- Need to flush the system - mainlines, submains, and laterals (in that order).
Flushing

- Silts and clay particles pass through even the best filters.

- Need to flush the system - mainlines, submains, and laterals (in that order).
  - Flush laterals by hand or can be manifolded together for flushing.
Questions?

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For Powerpoint presentation, go to:
http://schwankl.uckac.edu

ANR publications: http://anrcatalog.ucdavis.edu
Chemigation Uniformity in Drip Irrigation Systems
Uniform Chemigation

We want to have the material injected into the drip system to be applied as evenly (uniformly) as the water applied by the drip irrigation system.
Uniform Chemigation

First, it is important to remember that once you start injecting, the injected material doesn’t immediately start coming out of all the drip emitters.

- It takes time for the injected material (and the water) to travel through the drip irrigation system.
Uniform Chemigation

What happens when we stop the injection?
Uniform Chemigation

It takes at least as long for most of the chemical to clear from the drip lateral as it took it to initially move through the lateral.

To take a long time for all the chemical to clear out of the drip lateral.

Running clean water after the injection is VERY important. It makes the application more uniform.
Uniform Chemigation

We also need to account for the time it takes for the injected chemical to move through the underground pipelines or layflat.

How do we do this?
Uniform Chemigation

The easiest way to determine travel times of chemicals (and water) through a drip system:

- Inject chlorine (at about 10 - 20 ppm) into the drip system and follow its movement through the drip system.

- It is easy to spot when chlorine reaches any point by testing the water with a pool/spa test kit.
Uniform Chemigation

In summary:

- There is no standard total travel time through a drip system. The travel times can range from 30 minutes to as much as 2 hours. Some drip tape manufacturer’s web sites will do a calculation for you.

- You need to test (using the chlorine travel time test) the drip system you’re concerned with. You only need to do this once - then you know the travel time through the drip system.
Chemigation Uniformity in Drip Irrigation Systems

- **Trees & vines** - injections should last at least 1 hour, and at least 1 hour (longer is better) of clean water irrigation should follow it.

- **Row crop drip** - injections should be at least 1 hour (2 hours is better) in length, and there should be at least an hour (2 hours is better) of clean water irrigation following injection.
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