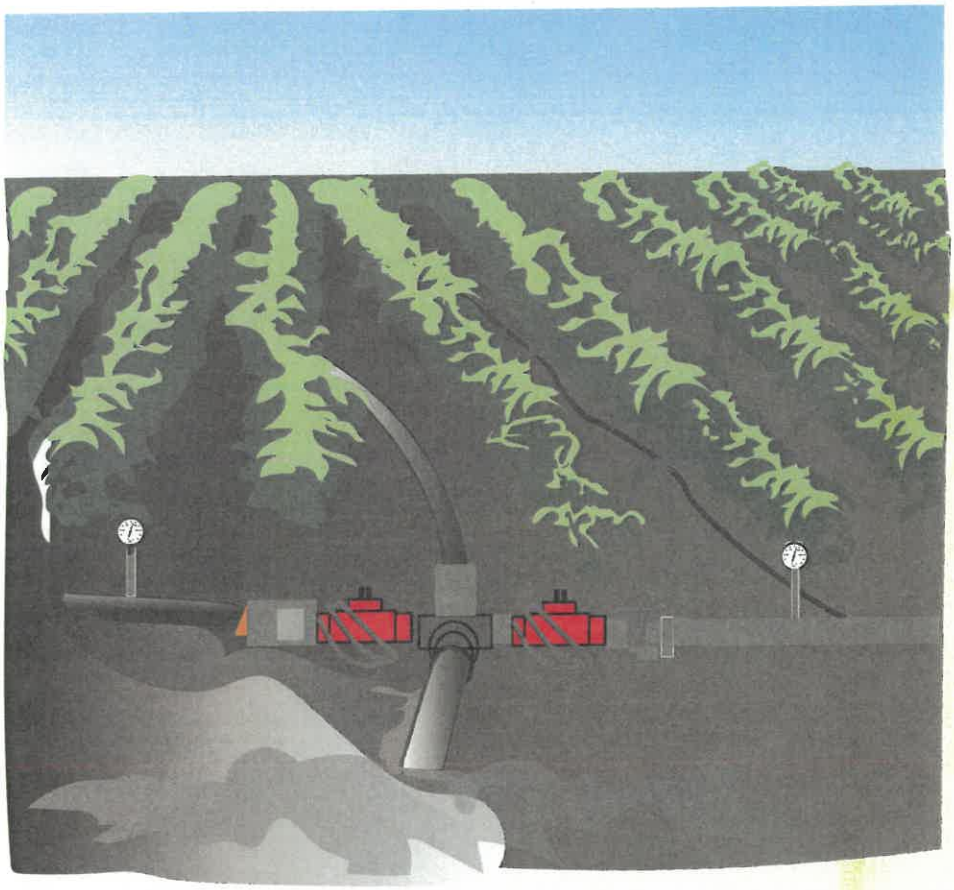
Micro-Irrigation Systems

Coalition for Urban Rural Environmental Stewardship



BMP

Operation and Maintenance Guidelines

Routine Maintenance

Frequency of Maintenance Depends on

- Source water quality
- Filtration system type
- Seasonal volume of irrigation water
- Emitter/micro sprinkler type

Maintenance Procedures

- Back flush filters daily/weekly/periodically based on source water quality and filter medium
- Inspect/repair/replace system parts:
  - *pressure gauges*
  - *pressure-regulating valves*
  - *flush valves*
  - *filter media (annually/biannually as needed)*
- Check/adjust pressure regulators
- Flush main lines/laterals
  - *pre- and post-irrigation season*
  - *approximately every 2 weeks during the irrigation season – more or less depending on your individual system*
- Check for leaks
  - *decreased pressure and increased flow, possibly water rings in soil away from emitters*
- Inspect/clean/repair/replace clogged emitters (weekly)

Annual/Biannual Maintenance Steps

- Measure emitter application rate and emission uniformity (annually/biannually)
- Inject water treatment to prevent clogging
  - *chlorine monthly*
  - *acid bimonthly/monthly*
  - *increase/decrease frequency based on source water constituents and system function*
- Always check the label and also with an expert (chemical manufacturer's representative, etc.) when injecting two chemicals at the same time
- Always flush the system with clean water after injecting chemicals or fertilizers
  - *Exception; chlorine left in a system*

Filter Maintenance

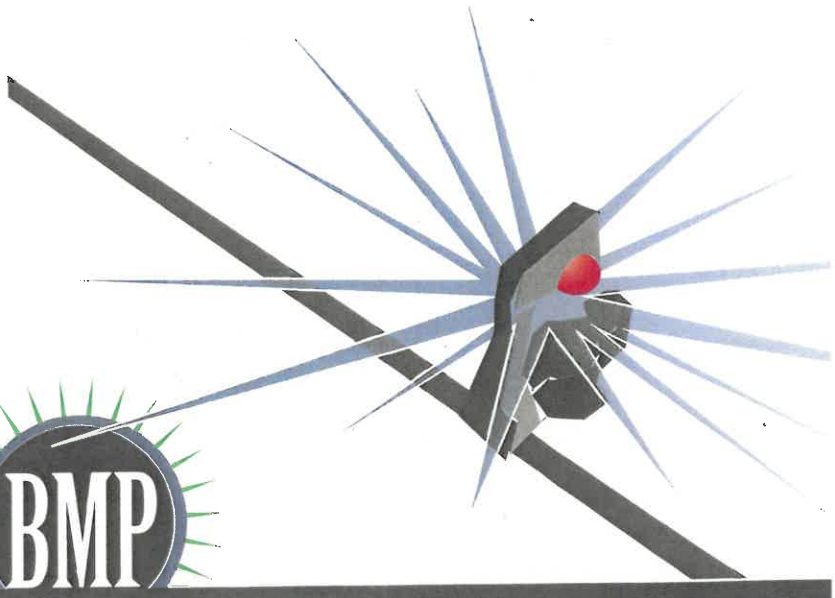
Proper maintenance of filtration systems is essential for the successful and efficient operation of your micro-irrigation system.

Centrifugal Separators

- Regular flushing – manually or automatically (check function of automatic valves every other day during irrigation season)
- Use a view tube on the back-flush line to see if water is clearing up at end of flush (or examine water being flushed to ensure back-flush was long enough to clear water)
- May need to adjust back-flush time to ensure water clears up

Screen and Disk Filters

- Periodically remove nylon strainer or bag and check for small holes
- Flush the screen filter
- Manually flush filter when there is a pressure drop (follow manufacturer's guidelines – generally about 5 psi) between the two pressure gauges
- Automatic flushing devices should be checked every other day during irrigation season
- Use a view tube on the back-flush line to see if water is clearing up at end of flush (or examine water being flushed to ensure back-flush was long enough to clear water)
- May need to adjust back-flush time to ensure water clears up



Sand Media Filters

- Adjust the restrictor back-flush valve to remove contaminated particles but leave sand
- Use a view tube on the back-flush line to see if water is clearing up at end of flush (or examine water being flushed to ensure back-flush was long enough to clear water)
- May need to adjust back-flush time to ensure water clears up
    - *Set pressure differential around 7 psi*
    - *Chlorinate the source water as needed to prevent/correct cementing of the sand*

Preventing and Remediating Clogging

A routine maintenance program can help avoid clogging of your micro-irrigation filtration system. Periodically cleaning the filter, flushing the lateral lines, and routine checking of emitters/microsprinklers for clogging are essential components of a micro-irrigation system maintenance program.

***Using the smallest amount of chemical needed to keep your system clean will keep treatment costs at a minimum and preserve the life of your irrigation system. The following guidelines will help you prevent or address clogging in your micro-irrigation system.

Chemical Precipitation in Emitters

(crusty white solid, orange/reddish staining, etc.) Calcium carbonate (lime), iron and magnesium precipitates are common causes of clogging when groundwater is used for irrigation. Adjusting the pH of the irrigation water can prevent or remediate chemical precipitates in micro-irrigation systems.

- Use caution and follow local laws, label instructions and expert recommendations
- Inject acid downstream of the filter unless using a polyethylene filter
- ALWAYS add acid to water (NEVER add water to acid)
- NEVER mix chlorine with acids or acidified fertilizer – it produces toxic chlorine gas
- Acidify water to maintain pH below 7
- Continuously inject acid to maintain pH around 5.5 (can decrease life of irrigation system)
- Intermittently inject acid for minimum of 30 to 60 minutes to maintain a pH under 4
- Extreme cases where emitters are completely clogged with calcium carbonate require acid injection to maintain a pH of 5, filling the entire system with the acidic water, and letting it remain in the system for 24 hours prior to flushing the system
- Common acids: sulfuric acid, muriatic acid, and hydrochloric acid
- Vinegar can be used by organic growers to prevent/remediate chemical precipitation

Biological Growth in Emitters

(slimes of various colors, algae, fungi, etc.) Bacteria (generally feeding on iron/manganese) form filamentous red, yellow or tan slimes, and algal, protozoan and fungal growths can also form in micro-irrigation systems. Chlorine injections can be used to prevent or treat bacterial, algal and fungal growths, which can clog filters and emitters (chlorine use is limited for organic growers).

- Use caution and follow local laws, label instructions and expert recommendations
- ALWAYS add chlorine to water (NEVER add water to chlorine)
- NEVER mix chlorine with acids or acidified fertilizer – it produces toxic chlorine gas
- Continuous injection of chlorine at a concentration of 1 to 2 ppm residual chlorine at the ends of the laterals or periodic injection of chlorine at concentrations of 10 to 20 ppm for 2 or more hours.
    - *Flush laterals after periodic injections*
- Common sources of chlorine: chlorine gas, sodium hypochlorite (liquid), and calcium hypochlorite (powder or granules)
- Hydrogen peroxide may be used by organic growers to eliminate biological growths

Please note chlorine will cause iron and manganese to precipitate, which may cause additional clogging; chlorine may also decrease the effectiveness of pesticides and fertilizers, so DO NOT inject these chemicals at the same time.

Root Intrusion in Subsurface Systems

Root intrusion is most common in permanent crops, occurs primarily near emitters but can also enter in the tubing, and is generally more of a problem in spring and fall. The following information on preventing and remediating root intrusion is intended to give you a starting point for further discussion with your irrigation design specialist, PCA and other growers in the area.

- Some drip emitters are impregnated with an herbicide
- Use frequent irrigations to maintain saturated soil near emitters (not effective with water loving crops such as celery)
- Periodic injections of acid or chlorine (frequent acid injections keeping a pH less than 4 can be damaging to emitters)
- Periodic injections of copper or an herbicide (*speak to a PCA before implementing one of these practices)
- Place emitter outlets away from the drip tape seam
- Placement of drip lines midway between rows may also help with some crops

Soil Ingestion

When a vacuum is created in drip tape, sediment can be pulled into emitters and cause clogging in the emitters and the drip lines. The following equipment can help prevent soil ingestion when incorporated into your micro-irrigation system.

- Install vacuum relief valves in the drip line manifold or flushing manifold at the upslope end of laterals
- Use drip tape designed to reduce/prevent ingestion with self-closing emitter openings when a vacuum occurs in the drip tape

Preventing Backflow Contamination

Your irrigation design company should have installed an air gap i.e. check valve or backflow device between the pump and the injector equipment. This prevents chemicals injected in the irrigation system from flowing back to source water should there be a power disruption or other equipment failure. It is essential to maintain and perform routine checks of the devices and valves to ensure their proper functioning.

- Devices at Water Source
  - *Chemigation check valve in mainline between water source and injection point*
- Low-pressure drain upstream of check valve
- Vacuum relief valve/air and vacuum relief valve upstream of check valve
  - *Low-pressure sensor downstream of irrigation pump*
- Devices in Injection System
  - *Anti-backflow injection valve between injector and injection point*
  - *Interlock between irrigation pump and injection pump*
  - *Solenoid valves on chemical injection lines*

How Do I Know It's Clogged?

Clogging in your system can be detected by increased pressure upstream of a clog and decreased flow downstream of the clog (check your pressure gauges and flow meters).

Avoid Injecting Combinations Not Approved by Chemical Supplier

Always check with an expert (chemical manufacturer's representative) before injecting two chemicals at the same time into a micro system. Certain combinations can react to form solids in a system that can clog emitters/sprayers. Others can react and form hazardous gases. Chemicals that should not be used in micro-irrigation systems:

- anhydrous ammonia
- aqua ammonia
- chlorine and any acid (produces toxic chlorine gas).