

# Troubleshooting Small Water Treatment System Processes

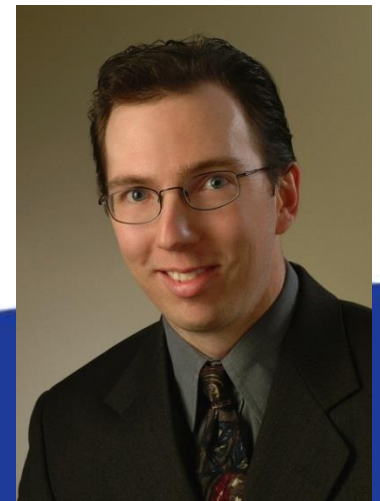
*Learn about some of the most common troubleshooting procedures that you can use to solve problems in your small water treatment plant. We will focus on common problems associated with UV and chlorine disinfection systems and common pre-treatment systems like water softeners and backwashable filters.*

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# Agenda:

General Troubleshooting Comments

Filter Cartridges & Backwashable Media Filters

Softeners and IX Filters

Ultraviolet (UV) Disinfection Systems

Chlorination Systems

Questions!



## General Troubleshooting Comments

Be prepared

Understand the problem

Know how equipment is supposed to work

Be methodical



## General Troubleshooting Comments

- Keep detailed records of problems including dates, times, environmental conditions, water test results, data readings; and, keep detailed records of attempted remedies and results
- Install sample ports and isolation valves to facilitate data gathering and testing
- Be aware of changes in your feed water quality including seasonality
- Check / test one thing at a time
- Consider that problems can be caused by a combination of factors
- Test your water! Get samples when problems are happening!
- Have the gear you need on hand (test equipment, parts, supplies etc.)
- Ensure your operating manuals are available and your emergency response plan contains procedures to help guide troubleshooting
- Seek help from peers, vendors, manufacturers, engineers./specialists, your DWO, Small Water Systems Online Help Center – you are not alone!

## Filter Cartridges & Backwashable Media Filters

### Decline in performance / loss of pressure

- Change in water conditions / pre-treatment
- Consider media fouling / media life
- Consider change in water temperature / pressure
- Failed backwash – power?
- Try “surge” backwashing, increase backwash duration
- Test / check pressures before and after each step in process

### Water leaking to drain / high water consumption

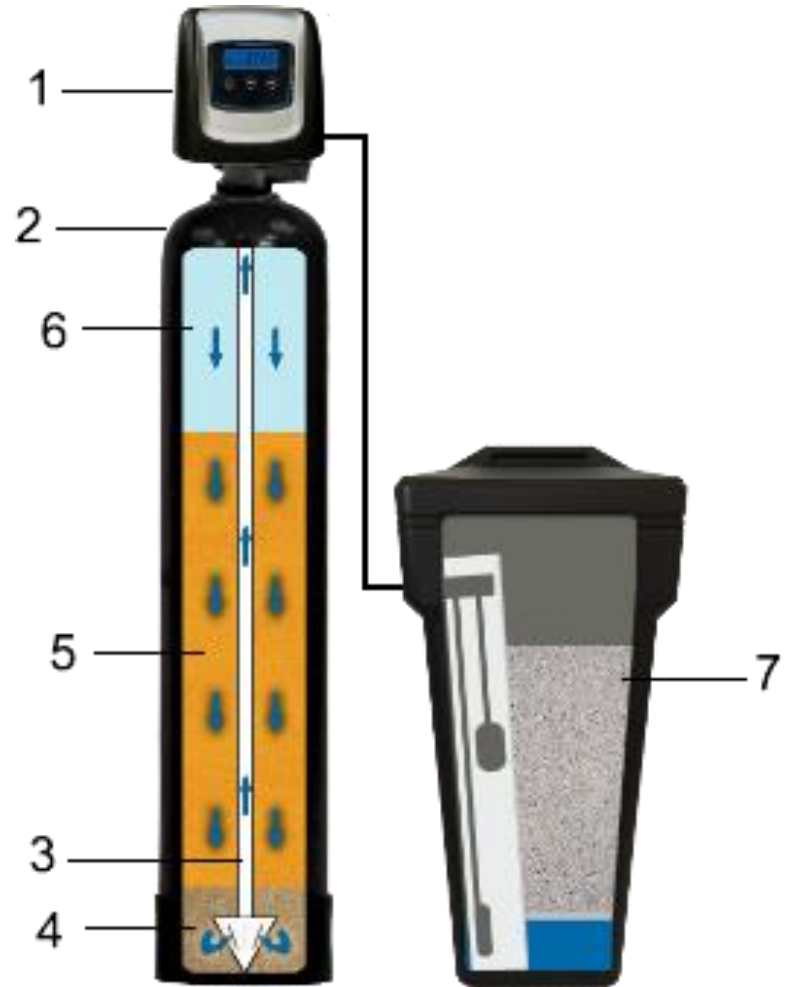
- Failed internal seal/spacer and/or piston



## Softeners & Ion Exchange (IX) Filters

Most IX problems can be generally traced to one of the following:

- Failing or failed resin
- Something preventing creation of good brine
- Something preventing brine from moving through system correctly





## Softeners & Ion Exchange (IX) Filters

### Poor or intermittent performance

- Hardness levels have increased – adjust programming
- Consider media fouling especially where iron and manganese are present – apply cleaners
- Natural decline in resin capacity – apply cleaners and adjust settings – consider a series of water tests over a full service cycle to evaluate resin capacity
- Test brine draw by removing brine line
- Check salt level and inspect for salt bridging
- Inspect and test flow meter
- Is the cycle length too short to make strong brine?
- Wrong resin choice for application?



## Softeners & Ion Exchange (IX) Filters

Brine tank too much water

- Check programming cycle times
- Do above noted brine draw test

Change in salt consumption

- Salt bridging
- Failed water meter
- Check cycle settings

Salty water after regeneration

- Clogged injector or injector screen
- Check rinse and brine fill cycle times

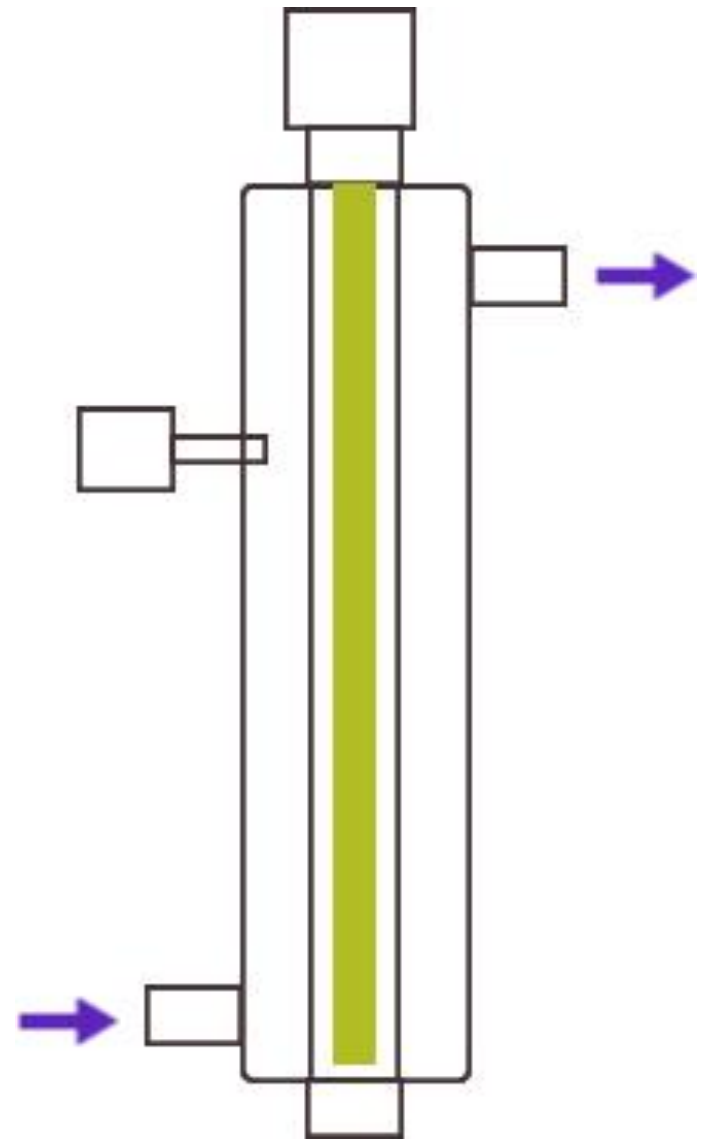




## Ultraviolet (UV) System Troubleshooting

Most UV problems can be generally traced to one of the following:

- Something blocks the UV light from reaching the water
- Environmental conditions result in reduce UV light output
- System fails to generate UV light of sufficient intensity





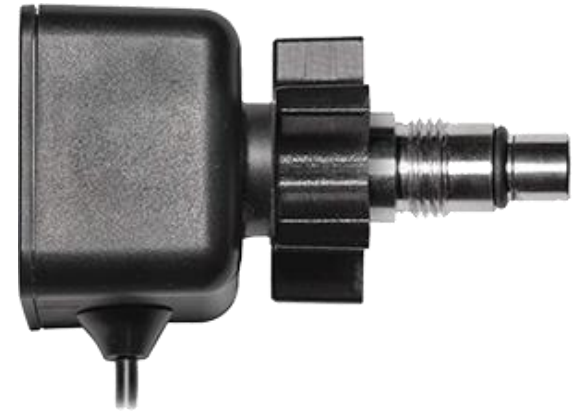
## Lamp Failure

- What is the age of the lamp – is it due for replacement?
- Inspect lamp for physical damage
- Install a new lamp – is problem resolved?
- DOA or pre-mature lamp failures are rare
- Possible other causes of non-firing lamp: ballast failure, power service failure (breaker, outlet, UPS, surge protector, fuse), reed switch/safety switch failed or not engaged
- Only use OEM lamps!
- Repeat lamp failures may be a sign of an environmental problem or bigger equipment issue
- Heavy on/off cycling?



## UV Intensity Alarm

- Make sure sensor is properly connected to controller
- **Clean UV sleeve and sensor window\*\*\*\*\***
- Perform a **dry test** / test UV Transmittance (UVT) if possible
- Consider over-heating or low temperature issues
- Chamber orientation – air and debris and temperature management
- Investigate lamp age – is it due for replacement?
- Considering installation new lamp then re-test, if still fails, install new sleeve and re-test – dry test
- Have water conditions changed? Spring freshet? Heavy rain? / Has the pre-treatment failed? Correlation to pre-treatment backwash or regeneration - Intermittent problem?
- UV intensity sensors do have a service life, they do not last forever





## Ballast / Controller Failure

- Often a default diagnosis after all other items are confirmed to be operational
- Best way to confirm is to install new ballast to see if the problem is resolved
- Repeat ballast failures often due to power supply surges – install a suitable surge protector or UPS





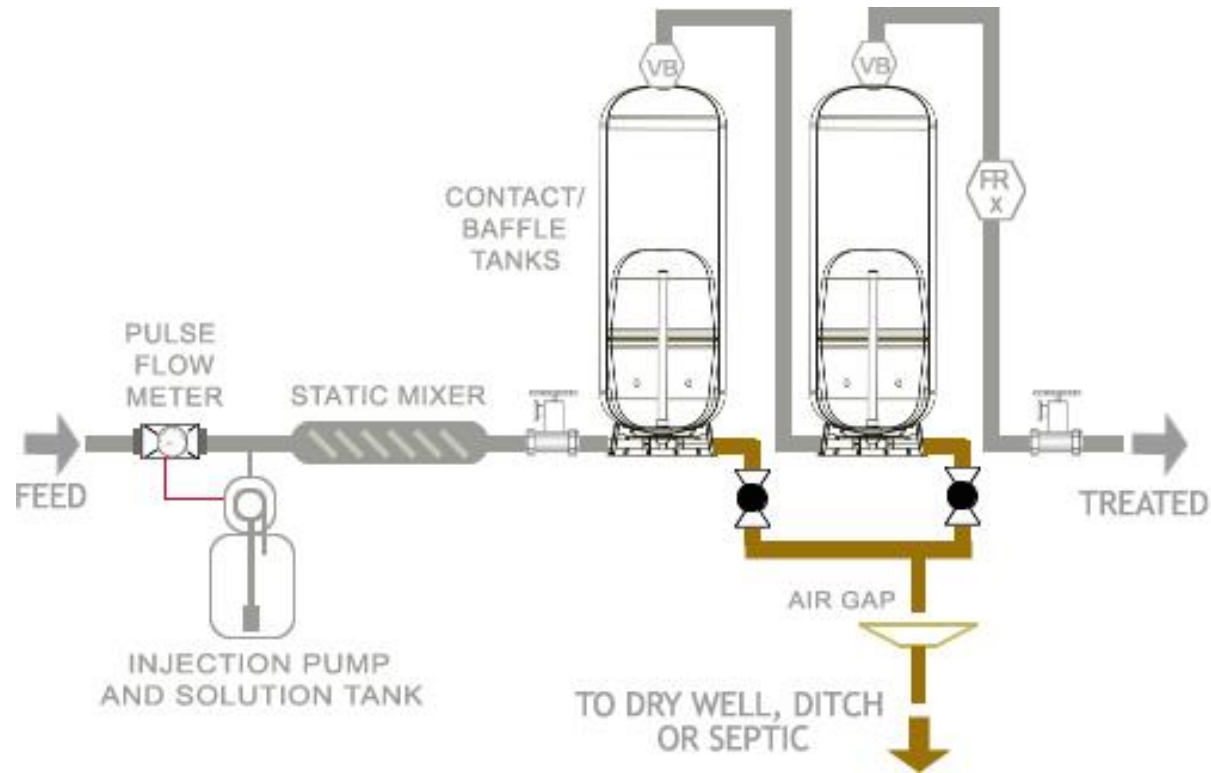
## Troubleshooting Redundant Systems

- If both units in alarm, **STRONGLY** suspect a water quality problem
- If only one unit is in alarm, suspect an equipment related problem – swap parts one at a time, you have all the parts available to determine the faulty part or fouled part

## Chlorination System Troubleshooting

Most chlorination problems can be generally traced to one of the following:

- Chlorine solution strength
- Inconsistent injection / mixing problems
- Changes in chlorine demand





## About the Chlorine (Sodium Hypochlorite) Itself

- Make sure it is NSF validated (NSF/ANSI Standard 60)
- Make sure it is **fresh** (<1 month old)! Chlorine degrades over time (about 50% in 6 mo.)
- DILUTE IT! For most small systems, we recommend diluting the 12% sodium hypochlorite from the supplier by a ratio of between 10 and 30 parts water to 1 part chlorine
- Use CLEAN water to dilute (RO or distilled)



## Low Residual Chlorine Level

- Where are you testing?
- Increase in chlorine demand (change in feed water conditions)?
- Weak / old chlorine solution
- Pump capacity cannot keep up with high flow rates at current rate of dilution
- Too much contact time or reduced storage turnover may be causing chlorine loss through dissipation. This can be common with seasonal operations. Consider secondary chlorine injection loop or adjusting storage levels.
- Clogged injection point, foot valve, or tubing or worn peristaltic tube







## Difficult to Maintain Consistent Residuals

**If you want consistent results on the outlet,  
you need to inject a consistent solution and mix it well.**

- High or fluctuating chlorine demand – consider additional pre-treatment for iron/manganese and organics, and source protection measures
- Make sure chlorine analyzer probes/sensors are clean and calibrated
- Are you diluting enough? (long pauses between injections of high concentrations)?
- Consider a static or active mixer
- Pump capacity cannot keep up with periodic high flow, or meter will not register low flows
- Too much contact time? (dissipation) – secondary chlorine injection loop



## Frequent Loss of Prime

- Off-gassing – reduce concentration – consider peristaltic pump
- Reduce tubing length
- Toot valve failure – clean screen and inspect check valve
- Solution tank running empty / low

## Disinfection Byproducts

- Add pre-treatment to remove organics, consider chloramine

## Complaints about Taste/Smell

- Residuals too high? Often we compensate for fluctuating chlorine demand by raising levels instead of increasing pre-treatment to ensure consistency in our feed water.



QUESTIONS?