

Is Your Water Softener Running Backwards?

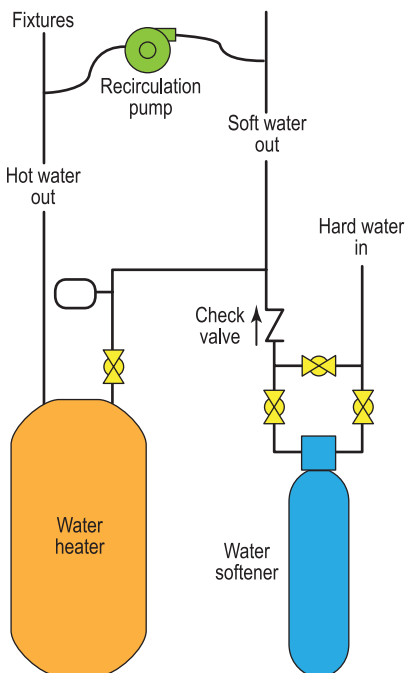
By Greg Reyneke, CWS-VI



Mechanical room with water heaters, softener and recirculation pump (red cylinder connected to the copper piping)

You install a water softener for your customer. Years go by with uninterrupted, trouble-free performance. Your customer adds salt as directed, has the system cleaned and disinfected every year by an authorized service provider; life is good and everyone is happy. A few months after the most recent cleaning, disinfection and preventative maintenance service, the customer reports an interruption in their soft water. No big deal, it is a 10-year-old system and probably needs a mechanical repair or resin augmentation. You dispatch a technician, who determines that there is absolutely nothing wrong with the system. She cycles it, produces soft water and makes an adjustment to the efficiency setting on the system to accommodate for potential fluctuations in influent hardness. Everyone's happy for a week or two and then the client reports no soft water again! You now dispatch a level-2 technician who checks every single faucet and fixture in the home to confirm no hard water crossovers. Everything is fine and he even opens the system to test the ion exchange resin and confirm the integrity of the valve/distributor interface. He short-cycles the system and produces glorious soft water!

Installation of a check valve to protect the softener from back-pressure and reverse flow conditions produced by recirculation pumps



Customer is happy and the tech promises to return the next week to follow-up.

No contact from the customer and the tech visits the home, expecting to be hailed as the conquering hero; no such luck. The client is friendly, bit insists their water is not soft and they now doubt his ability to actually diagnose and repair softeners. The technician checks everything on the system again and it works fine (mechanically) again. The tech cycles the system completely and produces 800 gallons (3,028.32 liters) of soft water. Tech and customer are both confused now. This is a rare situation that is fast becoming frustrating and costly. So what do we do?

A level-3 technician is dispatched to the home and looks at the problem holistically; assuming nothing and taking the time to evaluate the system as it operates through a partial regeneration cycle. He also carefully interviews the homeowner about any recent changes in the home, such as new appliances, fixtures or plumbing repairs. He takes detailed notes:

- Influent hardness: 30 gpg
- Influent TDS: 580 ppm
- Effluent hardness, cold: 20 gpg
- Effluent TDS, cold: 420 ppm
- Effluent hardness, hot: 19 gpg
- Effluent TDS, hot: 940 ppm
- Hardness after regeneration: 4 gpg
- TDS after regeneration: 525 ppm
- Influent pressure static: 42 psi
- Influent pressure at 5-gpm flow: 20 psi

He opens the brine tank and carefully inspects the air-check assembly for obstructions then checks the safety brine valve assembly for proper functionality and air ingress. The technician checks all fittings to and from the softener and everything seems to be within specifications. He places the system into regeneration again and closes the inlet supply valve on the three-handle bypass; water continues to flow down the drain. Being a larger home, the technician assumes this is normal and lets it run. After two minutes, he deduces that this is *not* normal and begins to look for

the causes of this anomalous situation. Stepping back in the mechanical room, the technician notices there is a newly installed hot-water recirculation pump running on a timer. He unplugs the pump and the anomalous flow immediately stops.

Hot water recirculation pumps are a great way to provide homeowners with fast access to hot water, and they are becoming more common as prices decrease and plumbers become more comfortable with new technologies. While fast hot water is great, recirculation pumps can present a distinct problem for any Venturi-based water softening, conditioning or filtration appliance when improperly sized or installed without consideration for the water treatment system. The recirculation pump in this particular home was over-sized for the application, causing it to develop excessive pressure on the recirculation line, which in turn forced water into the outlet of the water softener during regeneration.

When the water softener cleans, it relies on the Venturi effect (passing a volume of fluid past an orifice to generate vacuum). Vacuum sucks regenerant fluid from the regenerant tank into the media bed, to perform a cleaning or regeneration cycle. If the flow

of water past the orifice is interrupted, there will be inadequate or intermittent vacuum, which can cause a host of complications. This poor water softener was being intermittently exposed to pressure differentials that precluded it from regenerating properly, and also from adequately rinsing away the regeneration byproducts. The fix to this situation was a simple check valve, installed immediately downstream of the softener before the hot water recirculation return line, preventing this problem from occurring again. The devil is always in the details.

About the author

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