A Softener Maintenance Program Could Benefit Your Business

by C.F. "Chubb" Michaud

Although the ion exchange process is based on a reversible equilibrium premise, not everything that goes into a water softener comes back out. This is especially true with the newer, more brine efficient units that work with lower salt settings. Also, conditions change from time to time with the water source and the season as well as the type and level of treatment from the water supplier. Eventually, there can be enough accumulation to impair the normal operation of the water treatment system. This is called fouling and it can take many forms.

The signs of fouling are easily recognized. There may be an "off" taste or odor from the tap. Water pressure may drop off. Color may change and staining (brown, yellow, black) may occur. Hardness leakage will increase and generally, the customer may complain about not having enough soft water (low capacity).

One or more forms of fouling can occur at the same time. Routine maintenance will prevent the problem more easily than trying to correct a severely fouled system. Learning to spot the problem and providing the proper remedy could give rise to multiple service contracts and good word-of-mouth advertising for future business.

The process

Softeners are regenerated with sodium or potassium salts which leave the reactive exchange sites in the mono-valent Na^{+} or K^{+} form. These ions are held less tightly than di-valent and tri-valent ions such as calcium (Ca^{++}), magnesium (Mg^{++}) or aluminum (Al^{+++}). Therefore, these ions will be exchanged for sodium or potassium which then enter the supply water on an equivalent basis to the hardness level removed.

Although all of the hardness is not stripped from the ion exchange resin with each regeneration, enough is removed to reach a favorable equilibrium so a working capacity is restored. However, calcium and magnesium rarely cause fouling of softeners. On the other hand, low levels of iron (Fe^{++}), manganese (Mn^{++}), aluminum (Al^{+++}) or barium (Ba^{++}) can. Knowing that these ions are present allows for preventative measures to avoid fouling. More frequent regeneration and the judicious use of resin cleaners solves the problem. However, ionic fouling is only part of the potential problem. Dirt, oil, organics, algae and bacteria can also cause fouling and poor performance. The best form of protection is a good water analysis prior to installation. There's more to it than counting drops. City suppliers can generally provide a detailed analysis for the asking. Wells should be tested.

Restoring the operating capacity to a residential softener is complicated by the fact that they really weren't designed for post installation service. Frequently, they are installed without a bypass and they may be hard plumbed, making even the temporary removal for shop servicing nearly impossible. Nonetheless, there are a few quick-fix remedies to try.

The problem

The most common type of fouling is iron and/or manganese fouling. These ions enter the system in a reduced state as soluble bicarbonates and are picked up on the exchange resins. Oxygen or chlorine entering the system can oxidize these ions to their insoluble hydroxide forms with time. Salt regeneration will not remove them. Eventually, there is enough accumulation to blind the resin, and capacity and performance then drop. The same is true of aluminum, barium and other multivalent, metal ions that may be present in the feed water.

If there is sufficient oxidation taking place prior to the softener, these ions will enter the system as a fine precipitate (red water, black water, hazy water). These precipitates are quite sticky and can adhere to the resins and compact during service. Ordinary backwashing may not remove them.

Iron-fouled resin will generally bleed iron as well as hardness during the service cycle. Stains may appear on porcelain fixtures and "off" color and taste may be evident. Inspecting the toilet tank can reveal the problem because there may be a build up of red or black precipitate. Aluminum is more difficult to detect other than through analysis. However, a hardness bleed during service is a pretty good indication that something is wrong and it is interfering with the softener's ability to remove hardness.

The analysis

Hardness leakage can also occur as a result of dirt, oil, algae or bacteria fouling. Pinpointing these problems may take some detective work. Site inspection may be necessary. Here are eight things to consider when troubleshooting complaints:

1. Check the brine tank for salt and proper draw.
2. Ask how old the unit is. If it is 10 years or more, it will be better to re-bed the resin. Conduct an autopsy on the old resin and recommend the installation of the proper equipment to prevent a recurrence.
3. Ask the customer to show you the problem. Is it color, smell, appearance, particulate? Did the problem occur suddenly or over time? Have they seen it before? Did it go away?
4. Run water through several taps into the sink or tub. Is the pressure about the same? Remove the aerators from the taps and look for debris.
5. Inspect the toilet tank. Is there slime or color present? Are there stains on the porcelain in the tub or sinks? Iron will leave red or brown deposits. Manganese will be black. A heavy gray or white could be aluminum. Green slime is a sign of algae.
6. Turn on a shower with cold water only. Is there any odor? Try the hot water. Bacteria can grow in the hot water heater. These are generally sulphate reducing types and the odor of hydrogen sulphide (rotten eggs) will be present.
7. Check inlet water for chlorine, iron, manganese, hardness and pH. Then check the treated water. Taste it, smell it. What do you think?
8. Place the unit in backwash and note the appearance and flow rate of the effluent. Is there color, odor, algae? Is the flow adequate (6 gpm/sq. ft.) to clean the unit? Time the backwash. Is it at least 30 minutes? If not, extend it and adjust the controller.

The solutions

If you cannot get inside the troubled unit, the only treatment avenue you have is through the brine well. In any case, this is adequate. If you intend to remedy the situation right there, you will want to add a chemical assist to the brine well. As an alternative, you may wish to mix up your treatment chemicals in a separate bucket, then disconnect and extend the brine line so as to draw from the bucket. You will need about 10 gallons of solution per cubic foot of resin.

Iron, manganese, and other metals

Mix two cups of citric acid (powder) in 10 gallons of 140^0 F water. Draw full amount into tank during brine draw cycle. Let stand for 30 minutes. Continue with displacement rinse. Reset control to brine draw. Reconnect brine line and let unit regenerate with salt. Flush lines and restore to service.

Add one pound of citric acid to brine tank for each estimated 50 lbs. of salt. Stir in. Add 1/2 pound of citric acid directly to brine well. Install resin cleaner system for preventative maintenance.

Heavy dirt

Use procedure for iron fouling except do not hold acid in tank. Mix up two pounds of soda ash (Na_2CO_3) in 10 gallons of water and follow the citric acid with this. Do not rinse. The soda ash will gas off CO_3 when it contacts the acid and any hydrogen sites (from the citric acid) on the resin beads. This will agitate the bed, loosening dirt. Make sure the unit remains vented in the backwash position to allow gas to escape. Follow with a thorough backwash and regeneration with salt to clean the bed and restore resin to full sodium form.

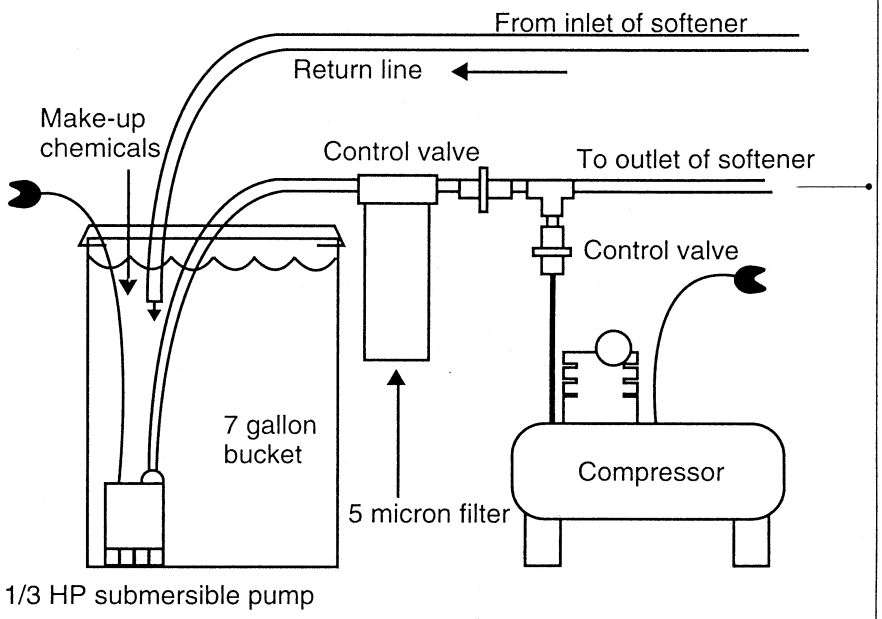
Algae, bacteria

Add two cups household bleach to 10 gallons of warm water. Draw in using bring cycle as above. Hold for 30 minutes. Skip rinse cycles and put unit back into service mode. Turn on all the faucets in the house (not full tilt) including tubs and hot water lines. Rinse chlorine out through faucets until a strong chlorine odor is detected. Do not flush toilets. Regenerate unit. Add one small chlorine tablet or one tablespoon of granular chlorine product (for pools) to brine tank for each bag of salt and drop one down the brine well. Repeat as necessary if problem persists.

Oil

This is rare but anything can happen. Add one cup of Spic 'N Span or good dishwashing detergent to 10 gallons of hot water. Draw in through brine line. Hold for 30 minutes, then regenerate with salt. Rinse lines through cold water faucets.

FIGURE 1
CLEANING SKID



Cleaning skid

A better job can be done with continuous recirculation rather than a hold period. The best way to do this is to build a cleaning skid as shown in *Figure 1*. If a system cleaning service is part of or can be a part of the future of your business, a cleaning skid is a must.

Disconnect softener and hook up skid so as to input through the service outlet (up flow through tank). Return is from the inlet. With the bed in an expanded mode, chemicals can be added to the reservoir (bucket) and recirculated.

To get a good scour on fouled resin, use an air pump at 4 CFM per cubic foot of resin. This will also assist in ridding the bed of precipitated iron, dirt or biomass. With the unit in the service position, introduce air until you get a good rumble, then turn on the pump. Change the water as needed by running a garden hose into the reservoir and the return down the drain. Add chemicals as needed. Recirculate and rinse. Use adapters with quick connect fittings to hook up to any system.

Always regenerate the system as a final step and flush all lines after introducing any chemical cleaners to the system.

Soft water use is advised for any solution make-up and rinse. Hot water (140^0 F) will increase the efficiency of any cleaning. Recirculation increases cleaning efficiency.

Pressure drop problems can also come from bead degradation due to chlorine or other oxidizers in the feed water. A GAC (granular activated carbon) filter preceding the softener is advisable if chlorine levels are 1 ppm or more.

Conclusion

Ben Franklin said that "an ounce of prevention is worth a pound of cure". Although water softeners hadn't been invented then, Ben must have known they were coming. The best way to maintain a water softener is to have a good water analysis and do a proper installation. Dealers would be well advised to install an empty filter housing in front of a softener to facilitate the addition of treatment chemicals later on. This would be strongly advised for non-municipally supplied water sources such as wells.

It may not be possible to cure a problem all at once. It may take repeated efforts. This can be done by layering the treatment chemicals into the brine tank so that a little work is done with each regeneration.❑

About the author:

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Correction: Omission

In the March issue of WC & P, several columns of the Creative Marketing article on pg. 20 were omitted.

Mr. Coffee showed its pitcher filter, a resin and carbon unit rated for lead reduction with a suggested retail price of $29. Filters, rated at 100 gallons, carry a suggested retail of $12.99. We can expect new products in the drinking water category, perhaps under its new parent's brand, Healthometer.

WTC/ECOMASTER introduced the most technically intriguing pour-through filters ever in the mass retail market. The Purelt water filtration system is the first pour-through drinking water system rated for *cryptosporidium* and *giardia*. An optional one micron "cyst prefilter" is said to remove all waterborne pathogenic spores. Activated carbon and a special lead removal media are combined in a system rated for 90 gallons. Suggested retail for the Purelt pitcher is $24. A Refrigerator Dispense model with a gravity faucet is slightly higher, according to the manufacturer. Replacement cartridges will retail for approximately $10. Units have been tested and certified to NSF standards 42 and 53. This upscale system is being tested in some 60 Target discount stores.

This market is constantly evolving and holds much success and growth for the coming years. Stay tuned.❑