Commercial Water Softener Repair Guide

Meeting the needs of your customer

By Jerry Horner

Commercial water softener malfunctions are generally very similar to residential problems. Don't let the size of the system scare you off from what can be very profitable repair service work. Many dealers are intimidated by a 48-in. diameter softener leaving a vacuum that can be filled by competent service companies in a less competitive atmosphere. Market conditions make commercial service repair work in higher demand and repair rates should be commensurated with this increased need.

This article will briefly address some of the more common commercial softener complaints and examine how to diagnose and hopefully correct them.

Hard Water

In most applications, a properly operating water softener will produce less than one grain per gal. of effluent hardness. In commercial applications, this will often be less than 4 mg/L or about 1/4 of a grain per gal. It is critical to have an understanding of the hardness removal needs of the particular application in order to diagnose the problem correctly. It is not uncommon for a commercial application to call with hard water problems even when the hardness level may be less than one grain. For commercial service, you will often need a hardness test kit that accurately measures in mg/L as many applications will require low levels of hardness leakage. So, the first steps are to know the needs of the customer and have the proper testing equipment to evaluate those requirements.

Observation Prior to Perspiration

Talk with the on-site engineers about the symptoms and how they have been maintaining the system. This can provide critical details and save you a lot of time and anxiety. For instance, they may have recently changed the regeneration schedule or made adjustments to the gallon setting. They may not be maintaining the salt level consistently or may note that the salt level has been the same for an inordinate period of time. Seek information about things that have changed or occurred recently that may have a deleterious result on the softener's performance. Note the current settings and meter status upon arrival and of course test the hardness on the outlet of the softener. If you find soft water exiting the systems, but not at the application location, check for hard water bypassing problems. This will often be found at a gate or ball valve as part of an "H" pattern three-valve bypass that is not completely closed. Be careful when checking these valves as they are commonly not in a very good condition. Measure the brine level and calculate the actual amount of salt being dissolved using a readily available brine dilution information chart. Don't count on the brine refill setting to determine this information. Confirm the brine is saturated (a salometer is quite handy for this test) and that a salt bridge does not exist. Note that up to this point, you have completed several preliminary steps, but have not started any diagnostics. Thorough observations and notes prior to starting any work will save time and help eliminate wasteful, unneeded trouble-shooting steps.

Regeneration Initiation

A common cause of hard water is a failure of the system to automatically initiate regeneration. First, you must determine if the unit is failing to regenerate or if the problem is the regeneration process itself. If the unit is actually failing to initiate regeneration, then look for clues to the potential problems. Failed regeneration can be the result of simple things such as lack of power or a non-functioning motor. Confirm the system has a permanent 24/7 power supply not controlled by a remote switch. A meter or sensor that is not operating or not working accurately will result in failed or delayed regeneration initiation. For time clock initiated systems, make sure the "pins" are set correctly to initiate regeneration as needed. You may find that the customer has been manually initiating regeneration to maintain soft water, so don't let a soft water test fool you into concluding that all is well. A softener that consistently produces hard water until manually initiated is probably experiencing a failure to regenerate automatically.

Ineffective Regeneration

Poor regeneration is typically a result of little or no contact of the brine solution with the resin bed. The resin must come into close contact with a strong brine solution to break the chemical bonding of the hardness minerals to the resin beads. This overwhelming concentration of brine replaces or exchanges sodium for the collected hardness minerals. Failure to bring the brine solution into contact with the resin bed can be the result of many possible malfunctions.

The ejector is designed to increase the flow of water through the tapered inlet orifice resulting in a lowered pressure on the suction side. Atmospheric pressure then pushes the brine solution into the inlet stream where they mix and proceed through the controller and into the resin bed. The ejector orifice is quite small and susceptible to clogging by foreign matter from the salt or other debris from the brine tank. Outdoor brine tanks are especially prone to these problems from leaves, bugs and other matter. It is important to use a clean, good quality salt to limit the debris loading. Instruct the customer to prevent pieces of the salt bags from being dropped into the salt as this trash is bound to eventually break down and clog the ejector. Completely empty and clean the brine tank on a regular basis to proactively mitigate this problem. In any case, the ejector assembly will have to be disassembled and thoroughly cleaned of any debris.

Going beyond a simple clogged injector, you should look for other possible causes of brine draw deficiencies. Check for good suction at the brine tank to determine whether or not the problem may stem from the air check and or float assembly. A clogged, restricted or improperly designed drain line will prevent brine draw. Inspect and clean any debris from the drain line flow control assembly, and if possible, test the brine draw with the bulk of the drain line disconnected. Worn internal parts or debris trapped in the controller mechanisms may require a complete valve overhaul to rectify the problem. Inlet working pressure must be at least 25 psi to maintain brine draw. Dirty or worn out resin will prevent brine draw due to pressure drop across the injector from the restricted water flow through the media bed.

Under some conditions the brine will be drawn out of the salt tank, but it still may

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not regenerate the resin properly. In one scenario, the brine solution following the path of least resistance will enter and immediately exit the mineral tank and flow to the drain. Knowing this, this problem can be easily checked for by conducting a simple test. Put the controller into the brine/draw cycle and monitor the taste of the water at the drain. During normal regeneration of an exhausted resin bed, the water at the drain will not have any abnormal taste at first. This is simply the water already in the tank being displaced by the incoming regenerant water. This is followed by a slightly and then severely bitter flavor to the drain water, caused by the displaced hardness minerals. Following the bitter stage is a somewhat salty stage caused by the brine water that is now doing very little exchange work as most of the hardness has been previously removed. There finally will be a clear water stage as all the brine and hardness have worked their way through the system. If during this process you find an almost immediate (within a few minutes) salty water flavor at the drain, you should inspect for a poor sealing point, often where the distributor pipe connects to the controller. Salty water to the drain so early in the regeneration is a clear indication that the brine is not being forced through the resin bed. Rather, it is sliding by a sealing point and taking the path of least resistance directly to the drain.

Resin Degradation

You should expect about 2–5% resin loss each year with efficient performance for approximately five to 10 years. In grossly undersized applications with high chlorine exposure and excessive service flow rates, resin can be destroyed in less than one year. The two most important factors to resin longevity are oxidation, mainly chlorine and service flow rate. Chlorine will chemically break down the resin with a resultant loss in structural strength that leads to fracturing and resin fines. Resin

degradation will cause a loss of efficiency, capacity and increased hardness leakage. Take a core sample of the resin to examine for consistent strength and size distribution of the beads. An inexpensive magnifying glass will assist in this process. Large applications may benefit from a third party resin analysis. Ultimately, there can be channeling, salty water to service and severe service pressure loss. In some applications, adding an influent granular activated carbon system makes long-term financial sense. A stronger 10% cross linked resin will hold up a little longer than the standard 8%, but this will only delay the ultimate degradation process.

Systems should be sized for peak flow rates of about 15 gal. per sq. ft. of bed area or 4 gpm per cu. ft. of resin. Higher flow rates are certainly attainable, but excessive service flow will have a direct deleterious effect on resin life. The high flow rates will literally crush the resin beads speeding the degradation process. There are many techniques used to replace resin including simple hydraulic "pumps" and vacuum systems. This can be a very profitable repair and it is a great time to combine brine tank maintenance and controller overhaul work. Cheap resin will require more frequent replacement, so sell quality resin at a higher price as your time and superior products are an added value worth paying for.

Conclusion

Your repair service work should not be limited only to the times the system malfunctions. For many commercial applications, this is far too late. Set up your commercial accounts on monthly or other regular service interval contracts to provide professional ongoing maintenance. Make efficiency enhancing adjustments based on fluctuating influent water hardness levels and keep the system in top working condition. The long term value you provide will result in expanding commercial softening opportunities. *wqp*

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