



## A Review of Residential Water Softening

### Water softener overview

Many residential households use water softeners to remove hardness from water. Water softening can have benefits including extending the life of appliances, preventing scale on fixtures, reducing energy use in water heaters, and decreasing the amount of cleaning products needed. However, there are some negative environmental impacts such as increased water use, and chloride from the salt discharged into surface waters where it is harmful to aquatic plants and animals.

Capital costs for water softeners vary widely depending on features and size. Professionals in the water quality industry can provide more detailed guidance and tailored recommendations. General features of water treatment options are described below for comparison but will vary by manufacturer, unit, and application.

### Demand-initiated Regeneration

Many older softener regenerations are time clock initiated, using electronic timers or clocks to recharge the resin at a pre-set time and day. This wastes salt and water because they regenerate whether or not regeneration is necessary. Most new softeners use a more sophisticated method called demand-initiated regeneration (DIR) where regeneration is based on the measured amount of water used.

- Cost: \$-\$\$
- Salt Use: 26 – 60% less salt than time clock softeners
- Water treatment: Provides softened water
- Maintenance: Clean tank every 5-10 years, check salt levels monthly
- Water Use: 25 – 40% less water than time clock softeners



*Demand-initiated*



*Timer initiated*

### Twin tanks water softeners

Multi-tank systems will improve salt and water use efficiency. They allow for continuous soft water supply since no reserve capacity is needed in a dual-tank system, saving salt and water.

- Cost: \$ ~30% more than single tank softener
- Salt Use: Up to 30% less salt than single tank softener
- Water treatment: Provides continuous soft water
- Maintenance: Clean brine tank every 5-10 years, check salt levels monthly
- Water Use: 15% less water than single tank softener



*Twin-tank softener*

### Hardness Sensors

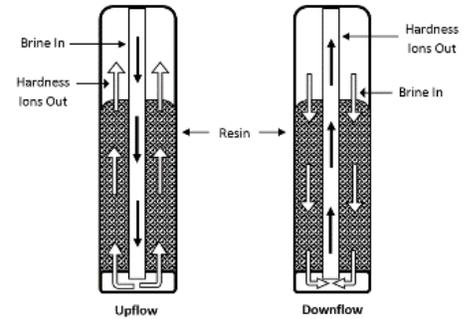
Some of the most efficient softeners are equipped with sensors that measure the hardness and initiate regeneration and/or adjust settings for optimal performance. Softeners with hardness sensors are best suited for areas where hardness fluctuates (check with city staff).

- Cost: \$\$-\$\$\$ for softener with hardness sensor
- Salt Use: Uses less salt
- Water treatment: Provides softened water
- Maintenance: Check softener manual
- Water Use: May use less water

## Counter-current regeneration

Down-flow or co-current regeneration is the more common type of regeneration. Co-current softeners require less maintenance where water contains iron or manganese. Up-flow or counter-current regeneration uses brine more efficiently; the brine flows in the opposite direction of the service flow through the resin that is least depleted to the resin that is most depleted. Less salt is needed for this process than co-current regeneration.

- Cost: \$-\$\$
- Salt Use: Up to 40- 50% less salt than co-current softeners
- Water treatment: Provides softened water
- Maintenance: check salt levels monthly, refill; professional check every two-five years
- Water Use: Up to 30% less water than co-current softeners



*Diagram of up-flow and down-flow regeneration*

## Water Softener Replacement

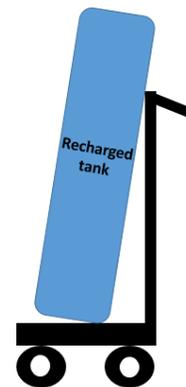
Water softeners become less efficient as they age. Replacing old household water softeners with newer models can improve salt efficiency. Over time and use, valves weaken, resin beads deteriorate, and softeners fail. Newer water softeners are designed to be more efficient.

- Cost: \$-\$\$ for new softener
- Salt Use: up to ~50% less salt with new softener
- Water treatment: Provides softened water
- Maintenance: check salt levels monthly, refill; professional check every two-five years and when family size changes
- Water Use: variable

## Exchange Program

In a water softener exchange service or program, a company delivers a recharged resin tank to the customer's home. When the tank needs to be regenerated, it is removed by the service company and taken to a central facility for regeneration. Tanks are exchanged on a regular schedule based on estimated water use and water hardness.

- Cost: \$-\$\$
- Salt Use: Will not reduce home salt use (salt is used to regenerate at central facility)
- Water treatment: Provides softened water
- Maintenance: No maintenance for homeowner, higher cost for tank delivery/exchange
- Water Use: Will not reduce water use (water will be used at the central facility for regeneration)



Key to Costs: \$= <\$1500   \$\$= \$1500 - \$2500   \$\$\$= \$2500 - \$5000   \$\$\$\$=>\$5000

For more information and resources visit the University of Minnesota Water Resources Center website: [www.wrc.umn.edu/watersoftening](http://www.wrc.umn.edu/watersoftening).

