



Commercial and industrial water softening

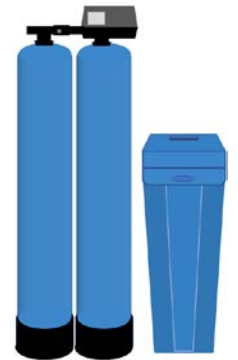
Commercial organizations and industries may soften water to prevent scale build-up on water heaters and boilers, to minimize staining from mineral hardness, or to produce high-quality water for manufacturing processes or products. Choosing the right water treatment for commercial or industrial water softening is dependent on many factors specific to each industry and its needs, and 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.

Soften only hot water or for certain appliances

Since hot water is more likely to cause scale build-up than cold water, softening only hot water lines is an option that reduces softening costs while protecting appliances. This option is most realistic for commercial users that can have some water hardness, such as hotels. Additionally, depending on the industry, water may only need to be softened for boilers or cooling towers.

Twin tank and multiple tank water softeners

Twin tank systems supply continuous soft water, and since regeneration occurs only when the tank capacity is exhausted, there are salt savings compared to units with one tank. Commercial users with high water use, such as schools, may use multiple tanks to accommodate high flow rates. These units provide the same benefits as twin tank softeners—less frequent regeneration and lower salt use—but require more space and plumbing.



- Scale: Household, commercial or industrial
- Cost: \$\$-\$\$\$
- Salt use: Uses 15-30% less salt than single tank softener
- Water treatment: Provides continuous soft water
- Maintenance: Clean brine tank every one-five years, check salt levels monthly
- Water use: Uses 15-30% less water than single tank softener

Counter-current regeneration

Water softeners that regenerate in the opposite direction of water flow (counter-current) regeneration use brine more efficiently than softeners with co-current regeneration.

- Scale: Commercial
- Cost: \$\$
- Salt use: Uses 35-40% less salt than single tank softener
- Water treatment: Provides continuous soft water
- Maintenance: Clean brine tank every one-five years, check salt levels monthly
- Water use: Uses 40% less water than single tank softener

Non-salt water conditioning technologies

There are several types of technologies available that claim to reduce scale build-up from water hardness without salt, but few have had their efficacy evaluated. Because of the softening needs of commercial users, many non-salt conditioning technologies are not widely recommended by water softening professionals.

- Scale: Household or commercial
- Cost: \$
- Salt use: No salt needed
- Water treatment: May limit scale build-up but does not remove hardness
- Maintenance and water use: Dependent on technology type

Brine reclamation

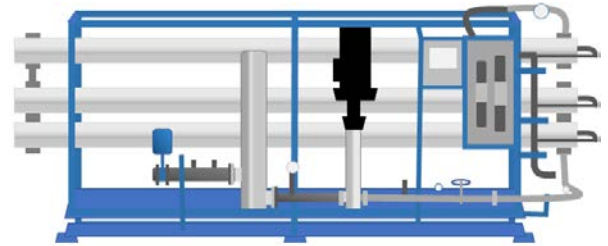
Softeners with brine reclamation reuse brine from the regeneration process, using less water and salt than standard water softeners. Brine reclamation can also be done in conjunction with reverse osmosis to increase recovery of wastewater, reducing salt and water use.

- Scale: Household or commercial
- Cost: \$
- Salt use: Uses 25-40% less salt than single tank softener
- Water treatment: Provides continuous soft water
- Maintenance: Elution study every 2-3 years and professional maintenance recommended
- Water use: Uses 35-40% less water than single tank softener

Reverse osmosis

Reverse osmosis (RO) technology uses a membrane to remove dissolved solids and other contaminants from water. Industries commonly use RO because it removes other contaminants in addition to water hardness. Pre-treatment of water is often required prior to RO to protect the membrane and may be done via ion-exchange water softening or use of chemical anti-scalant.

- Scale: Household, commercial, or industrial
- Cost: \$\$-\$\$\$\$
- Salt use: No salt needed unless ion exchange used for pre-treatment
- Water treatment: Provides continuous soft water and removes contaminants
- Maintenance: Replace membrane and filter as needed
- Water use: High water use; each unit of produced water discharges 0.5-1 unit of wastewater
- Energy use: High



Zero liquid discharge facilities

Zero liquid discharge facilities are used in industries such as oil and gas, mining, power, and petrochemicals, and are applicable in areas with high wastewater discharge standards and waste disposal costs. Wastewater is sent to a brine concentrator, then a crystallizer, then to solids dewatering, although other intermediate processes may be used as well, such as ion-exchange softening. Through these processes, salts are crystallized and can be harvested for disposal or, potentially, reuse.

- Scale: Industrial
- Cost: \$\$\$\$
- Salt use: No salt needed unless ion exchange used for pre-treatment
- Water treatment: Provides continuous soft water and removes contaminants
- Maintenance: Clean and maintain equipment as needed
- Water use: High water recovery
- Energy use: High

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

For more information and resources refer to the University of Minnesota Water Resources Center web site: wrc.umn.edu/watersoftening.

