



Water Softener Alternatives (Water Conditioners, Non-salt-based Systems)

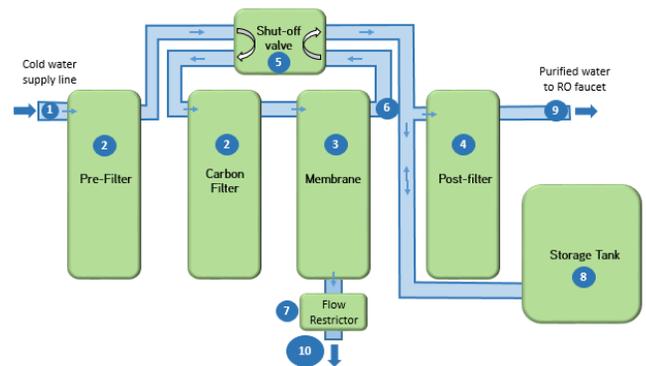
Water “softening” is the term generally used for removing calcium and magnesium by ion exchange – using salt. Ion exchange is by far the most common and most accepted process for scale control and for the reduction of residual compounds left after cleaning and bathing. While ion exchange media and the softener control systems are greatly improved, there are viable non-salt based alternatives available on the market.

Softening alternatives include several options that fall under the larger category of water conditioning. Some soften the water (remove the calcium and magnesium) and others do not but may inhibit scale formation by suspending the calcium and magnesium in the water. Reverse osmosis is a well proven technology but most of the other options are not as well proven. Carefully examine product claims before purchasing a device and check the reputation of the seller with the Better Business Bureau or similar resources. In Minnesota Water Conditioning Dealers and Plumbers are licensed to install water conditioning units.

Reverse Osmosis (RO)

Reverse osmosis (RO) technology uses a membrane and additional filters to remove dissolved solids and other contaminants from water. Whole house systems or small systems for drinking water are available.

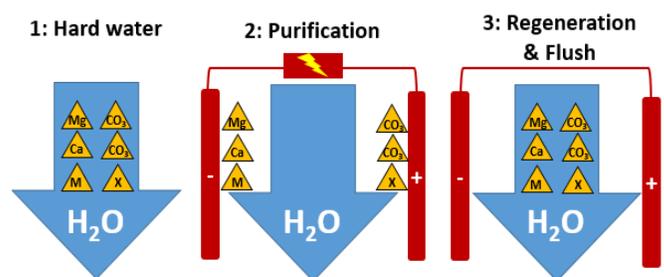
- Cost: \$\$\$-\$\$\$\$ installed whole house system
- Water treatment: Filter system, provides continuous soft water, removes contaminants
- Maintenance: Regular filter change/less frequent membrane change
- Water Use: High-uses up to 4+ gallons of water per gallon of filtered water



Capacitive Deionization (CDI)

Capacitive Deionization (CDI) uses current to attract ions to the anode and cathode. No salt is used. This method reduces concentrations of all ions to minimize scale formation and remove almost all hardness.

- Cost: \$\$\$
- Water treatment: provides continuous mostly soft water, except during backwash
- Maintenance: Backwash, citric acid cleaning
- Water Use: Backwash has 25% reject water



Electrically Induced Precipitation

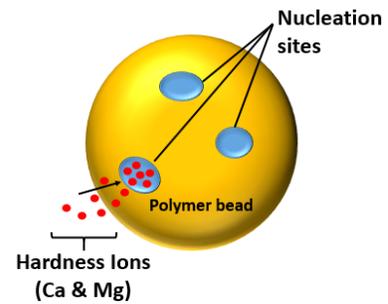
Electrically induced precipitation is a conditioning technology that uses an applied current to induce the formation of “soft” scale on an electrode, reducing scale by approximately 50%.

- Cost: \$\$-\$\$\$
- Water treatment: Descaler, reduces hard scale that builds up on fixtures and appliances
- Maintenance: Requires backwash to clean the electrode
- Water Use: Soft scale must be periodically backwashed, increasing water use

Nucleation Assisted Crystallization/Template Assisted Crystallization (TAC)

This technology uses resin beads to force hard ions in water to crystallize on the resin. When the crystals become large enough they are released as a fine dust in the water, preventing scale formation on surfaces. TAC systems generally require relatively clean input water. A filter may be needed to remove iron, manganese and sediment.

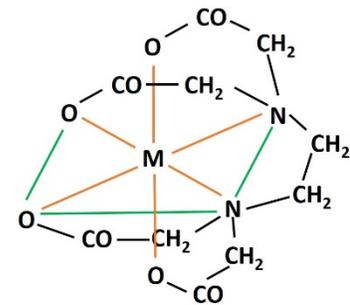
- Cost: \$
- Water treatment: Descaler prevents up to 90% scale buildup
- Maintenance: Requires replacement media every three years
- Water Use: Uses no extra water



Chelation

Chelation is a conditioning technology that uses a chelating agent (such as citric acid or EDTA) to tie up hardness ions, making them unable to form scale on fixtures and appliances. This technology may prevent scale buildup by up to 99% and may also remove existing scale. Chelation has not been well proven, especially for higher hardness levels (> 8-10 gpg), or if iron, dissolved oxygen, or dissolved silica are present.

- Cost: \$
- Water treatment: Descaler
- Maintenance: Filter changes every six to twelve months
- Water Use: Uses no extra water

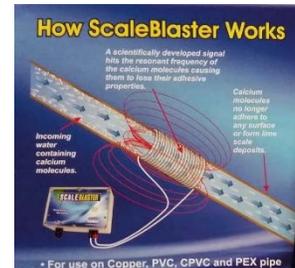


Chelating agent (EDTA) binding with hardness ions (M)

Magnetic

Magnetic water treatment is a controversial conditioning technology. It uses powerful magnets or electromagnetic devices wrapped around a pipe to create a magnetic field. As hard water passes through the magnetic field created by the device, it may precipitate out hard ions into a "soft scale" which prevents scale formation on fixtures and in appliances. Studies show mixed results on the effectiveness of this technology.

- Cost: \$
- Water treatment: Descaler, may reduce scale formation up to 50%
- Maintenance: none
- Water Use: Uses no extra water



Signal wire
electromagnetic device

Radio waves

Technologies using radio waves to remove and prevent scale are relatively new. The unit is installed on the outside of a pipe. The conditioner sends an electrical signal from a ring of ferrites to the water inside the pipe causing the ions to suspend in the water as clusters thus preventing them from attaching to surfaces.

- Cost: \$
- Water treatment: Descaler
- Maintenance: none
- Water Use: Uses no extra water



Radio wave device on pipe
Photo credit: Hydroflow

Protect Public Health

Whether you are connected to a public water system or you are on a private well, your health and the health of others is dependent on your water and your plumbing. Serious disease outbreaks occur every year in the US from plumbing mistakes or cross contamination of plumbing systems. Licensed installers are trained to safeguard your plumbing. In Minnesota you may install a water conditioning device in your own home, but carefully follow Minnesota plumbing code and get an inspection when available or required. Licensed installers are required in commercial and multi-family settings.

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.

