

Water Softening

- A water softener reduces the dissolved calcium, magnesium, and to some degree manganese and ferrous iron ion concentration in hard water
- A water softener works on the principle of cation or ion exchange in which ions of the hardness minerals are exchanged for sodium or potassium ions, effectively reducing the concentration of hardness minerals to tolerable levels and thus making the water softer and giving it a smoother feeling

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- The most economical way to soften household water is with an ion exchange water softener.
- This unit uses sodium chloride (table salt) to recharge beads made of the ion exchange resins that exchange hardness mineral ions for sodium ions.

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- As the hard water passes through and around the beads, the hardness mineral ions are preferentially absorbed, displacing the sodium ions.
- This process is called ion exchange.

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- Temporary hardness, caused by hydrogen carbonate (or bicarbonate) ions, can be removed by boiling.
- Calcium bicarbonate, often present in temporary hard water, may be boiled in a kettle to remove the hardness.
- In the process, a scale forms on the inside of the kettle in a process known as "furring".
- This scale is composed of calcium carbonate.
- $\text{Ca}(\text{HCO}_3)_2 \rightarrow \text{CaCO}_3 + \text{CO}_2 + \text{H}_2\text{O}$

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