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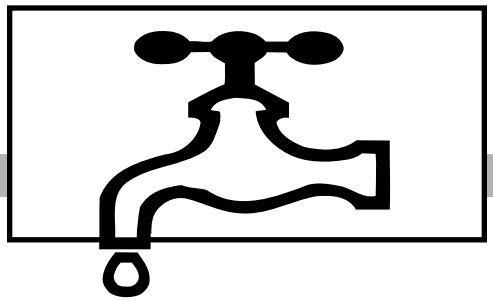

Household Water Quality

Water Hardness

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Hardness in water is the most common water quality problem reported by U.S. consumers. In fact, hard water is found in more than 85 percent of the United States. Hard water occurs when excess minerals in the water create certain nuisance problems. While these water problems can be frustrating, water hardness is not a safety issue. Hard water is safe for drinking, cooking, and other household uses.

Hard water can cause several problems for consumers including decreased life of household plumbing and water-using appliances, increased difficulty in cleaning and laundering tasks, decreased efficiency of water heaters, and white/chalky deposits on items such as plumbing, tubs, sinks, and pots and pans. Consequently, it is no surprise that according to the 1997 National Water Quality Survey, one out of five Americans surveyed is dissatisfied with the quality of his/her household water supply.

Causes of Hard Water

Approximately 22 percent of the earth's fresh water is ground water, and naturally, as it flows through soil and rock, it picks up minerals. Hard water results when an excessive amount of calcium and magnesium are present. Total hardness is measured in **grains per gallon** of water **(gpg)** or **milligrams per liter (mg/l)**. Grains per gallon (gpg) is a unit of weight for a volume of water, as is milligrams per liter (mg/l). Sometimes hardness is measured in **parts per million (ppm)**. Parts per million (ppm) measures the unit(s) of a substance for every one million units of water. Milligrams per liter (mg/l) and parts per million (ppm) are roughly equal in water analysis. One gpg (1gpg) is equivalent to 17.1 ppm or mg/l. When conducting chemical analysis, laboratories usually measure hardness minerals in either grains per gallon (gpg) or milligrams per liter (mg/l). You can evaluate the hardness of your water supply by referring to the following chart.

Grains Per Gallon (gpg)	Milligrams Per Liter (mg/l) or Parts Per Million (ppm)	Rating
less than 1.0	less than 17.1	Soft
1.0 - 3.5	17.1 - 60	Slightly Hard
3.5 - 7.0	60 - 120	Moderately Hard
7.0 - 10.5	120 - 180	Hard
over 10.5	over 180	Very Hard

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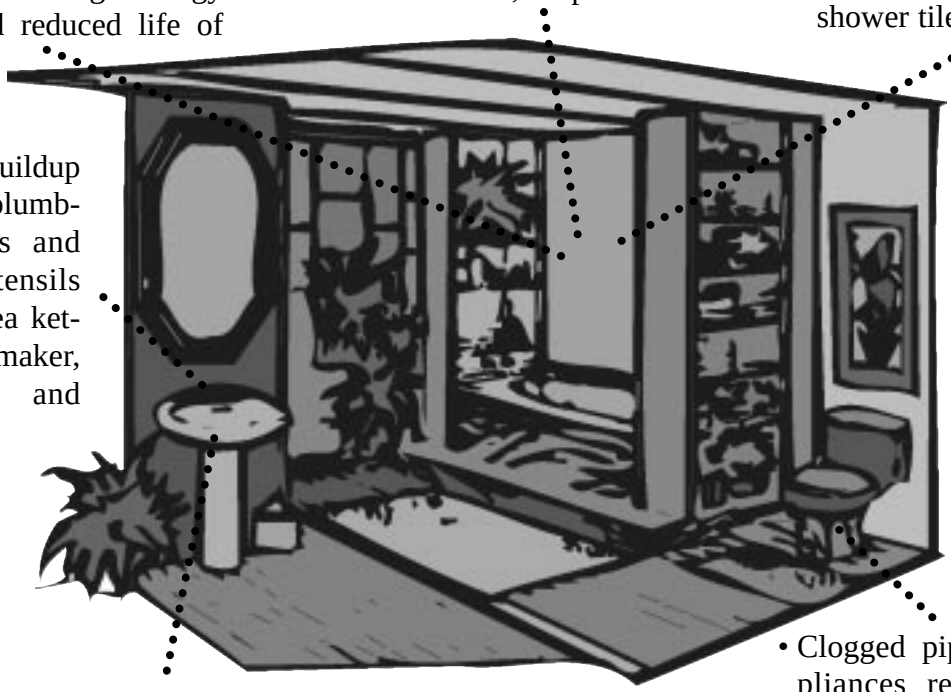
Identifying Hard Water

The best way to determine whether or not your water is hard is to have it tested. However, you can usually detect hard water by the evidence in your home, including:

- Decreased sudsing and cleaning capabilities of soaps and detergents, resulting in dingy laundry and reduced life of fabrics
- Film left on the body resulting in dry skin and dull, limp hair
- Soap scum on bathtubs, shower tiles, and basins
- Increased buildup of scale on plumbing fixtures and cooking utensils such as a tea kettle, coffee maker, pasta pot, and dishwasher



- Clogged pipes or appliances resulting in reduced water flow and increased repairs
- Increased water heating costs due to scale buildup and mineral deposits, and more frequent replacement of hot water heating elements

Treatment

The most common method to treat hard water is through ion exchange water softening. Ion exchange water softening is a process in which the hardness ions, magnesium and calcium, are exchanged with either sodium or occasionally, potassium ions. This is accomplished by directing the flow of hard water over a bed of plastic resin beads. Each bead has a slight electric charge, which holds the sodium on the bead. As the water flows over the beads, the hardness minerals (ions) are attracted to the beads. When the hardness minerals attach themselves to the beads, the sodium ions are displaced. Hence, the hardness ions are replaced by the sodium ions.

At some point the plastic resin beads will be covered with hardness ions and will no longer be able to remove hardness from the water. In order to remove the hardness ions from the beads, a brine or salt (sodium chloride) solution is added to the resin bed. This solution contains a high concentration of sodium ions, which remove the hardness ions from the beads. Next the solution and the hardness ions are flushed out of the resin bed with fresh water, and once again the beads can remove hardness from the water. This process is called regeneration.

How to Select a Water Softener

There are many different kinds of water softeners available. Before purchasing a water softener you should make sure that the unit has sufficient water softening capacity for your family. A typical person uses 100 gallons of water per day.

Another important feature to consider is how the equipment initiates the regeneration process. Water softening equipment uses three general methods of controlling water softener regeneration:

• time clock

• demand initiated regeneration

• metered

Of these three methods, demand initiated regeneration is considered to be by far the most efficient method of regeneration. Both this method and the metered method offer savings in salt and water usage over the time clock method.

Other important factors to consider are the warranty and the reputation of the manufacturer. Consumers can check with the Better Business Bureau for references and complaints. Furthermore, consumers are encouraged to talk to a Water Quality Association Certified Water Quality Specialist and research which products are needed before purchasing water softeners.

Certified Water Quality Specialists are individuals who work in the water quality improvement industry and have passed the Water Quality Association certification examinations. Water Quality Association member dealers can be located by looking under "Water Treatment Companies" in the yellow pages of your telephone directory.

Another helpful tip is to look for the Water Quality Association Gold Seal on the product. This seal assures consumers that the equipment has been tested against industry standards and validated for performance capabilities. Likewise, consumers can look for the NSF, National Sanitation Foundation, certification mark to ensure that they are purchasing quality products.

Health Related Concerns Associated with Softened Water

Softening of water with a common sodium-based ion exchange water softener does increase the sodium content in the water. Therefore, if you have health concerns about your sodium intake, consult your physician. It is important to note that many of these water softeners have a by-pass feature that will allow you to bypass the cold water in the kitchen. This will enable you to use unsoftened water for drinking and cooking. In addition, bypassing the cold water tap in the kitchen will prevent minerals from being removed from the water. In most cases, hard water does not provide a significant amount of minerals needed for good health. However, minerals add to the "taste" of water and can provide a trace amount of nutritional benefit. Sometimes in moderately hard water cases, only the hot water is softened. This is a compromise between reducing the hardness of water and increasing the sodium content.

Benefits of Softened Water

Consumers with even slightly hard water can benefit from using a water softening device. In fact, according to a New Mexico State University study, water heating efficiencies for softened water may be increased up to 29 percent when heating with gas and up to 22 percent when heating with electricity. Other possible benefits include:

- Increased life expectancy and efficiency of the plumbing system due to reduced clogging from scale
- Increased life expectancy and performance of water-using appliances
- Reduced soapy residue on clothes, skin and hair
- Reduced filmy deposits on tubs and shower tiles
- Reduced scratching of bathroom fixtures and sinks
- Savings in the amount of soaps and detergents used
- Decreased spotting, white chalky deposits, of dishes, pots and pans and glassware, etc.

For information on water testing or other water quality concerns, contact your local Virginia Cooperative Extension office.

References

1997 National Consumer Water Quality Survey, Opinion Research Corporation International, Princeton, New Jersey.