Quality Water for Idaho

Why Soften Household Water?

E. Porter

Most household budgets don't leave a lot of room for unnecessary waste. A penny wasted here or a nickel wasted there can add up to hundreds of wasted dollars during the course of a year. An often overlooked budget waster is hard water.

Hard water often is not an obvious problem to people who have had no opportunity to compare it with soft water. It is usually difficult to see or taste any difference between hard and soft water. The minerals that make water hard (calcium and magnesium) are usually tasteless and completely dissolved.

The differences between hard and soft water become obvious in bathing and cleaning chores. Hard water leaves a residue that combines with soap to produce a "soap curd" that must itself be cleaned off. Hard water also leaves soap curd on laundry.

Hardness minerals affect laundry gradually. People accustomed to washing in hard water may not notice the quicker fading of colors and yellowing of whites; shortened fabric life; increased wear on the washing machine; and extra detergent, hot water, and rinse and wash cycles it takes to get laundry clean. Yet the waste is there, working away at the family budget. Fortunately, hard water can be softened, and soft water virtually eliminates these problems and their financial impacts.

What is hard water?

Hard water is found throughout the world and in about 85 percent of the United States, according to the U.S. Geological Survey. Hard water areas exist where water has access to rock that contains calcium, magnesium, or both.

The U.S. Department of the Interior classifies hardness based on the concentration of calcium and magnesium in grains per gallon (gpg). A typical aspirin contains about 5 grains of material. Were the aspirin to be dissolved in a gallon of water, it would add 5 gpg of material to the water.

Water in the 1 to 3.5 gpg range is classified as slightly hard. Water in the 3.5 to 7.0 gpg range is considered moderately hard, and water in the 7.0 to 10.5 gpg range is considered hard. Very hard water has concentrations greater than 10.5 gpg. The harder the water the more it affects your laundry. Even moderately hard water can make a difference.

Hard water problems

Hard water can affect everything from soap's ability to clean to the life span of the washing machine. A study conducted by the American Institute of Laundering determined that detergent and laundering costs are twice as high in hard water compared with soft water.

Laundry soap—Laundry soap was the primary cleaning agent for washing clothing before the development of synthetic detergents. Soaps are usually made from fatty acids and alkali substances. These ingredients give soaps excellent cleaning properties, particularly when washing vegetable-based fabrics such as cotton.

Soap works well to suspend dirt in the wash (keep it in the water until it goes down the drain) and helps lubricate the fabric to prolong its life. Another advantage is that soaps generally are made up of 90 percent or

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more active cleaning agents, which cuts down on the amount required for cleaning.

Unfortunately, hardness minerals combine with soap to produce an insoluble "curd" that can remain as a residue on washed laundry. This is similar to the difficult-to-clean residue found on bathroom tubs, sinks, and tile in hard-water areas.

Hardness also tends to counteract soap's alkalinity, which reduces its cleaning ability and requires the use of more soap to get laundry clean. Soap manufacturers have partially answered this problem by adding "builders" such as complex phosphates, silicates, or sal-soda. Builders boost the alkalinity of the wash, improving its cleaning ability and helping to neutralize acid soil and hardness minerals. However, builders do not prevent the formation of soap curd.

Laundry detergent—Synthetic detergents, based on petroleum, were introduced in the 1950s, primarily to overcome hard water's soap curd problem. Unlike "unbuilt" soaps (soaps without added builders), which are over 90 percent active ingredients, unbuilt detergents contain only 20 to 40 percent active ingredients. They contain up to 50 to 65 percent neutral salts, which are a manufacturing by-product. The remaining ingredients are surfactants (which lower water's surface tension and improve its wetting ability), suspension agents (which help keep dirt suspended in the water), whitening agents, and cosmetic additives.

By itself, synthetic detergent is generally neutral and does not create the alkaline cleaning environment soap does. Most modern detergents contain builders to increase alkalinity, but in much greater quantities than in soap. Unfortunately, the builders tend to be consumed in softening hard water. This limits their ability to clean and requires more detergent to get laundry clean.

Rinse cycles and water temperature—The hotter the water is, the cleaner the laundry will be, particularly in hard water. Hard water reduces cleaning ability and interferes with rinsing, so you may need hotter water and extra rinse cycles in hard water. The energy to heat water and operate the washing machine for the extra cycles is an additional expense.

Fabric life and appearance—A Purdue University study found that fabrics washed in hard water wear out up to 15 percent quicker than fabrics washed in soft water. This is probably due to the presence of hardness residues in the fabric, making it stiffer and causing increased friction and wear on the fabric as it flexes.

The Purdue study also found that colors fade and whites darken more quickly in hard water. In addition, the study found that laundry washed in hard water becomes resoiled with greater ease.

Washing machines—The dissolved minerals in hard water tend to collect in water-using appliances and shorten their life. The buildup of hard water minerals can clog pipes and cause excessive wear on moving parts. As a result washing machines run with hard water can wear out up to 30 percent quicker, according to a study reported by the American Water Works Association. A washer that might otherwise last 10 years will likely last only 7 years when run with hard water.

Solution: Water softening

The best solution to hard water problems is to use soft water. Earlier generations coined the phrase "hard water" because they found it hard to wash with. Their solution was to collect soft rainwater in a barrel.

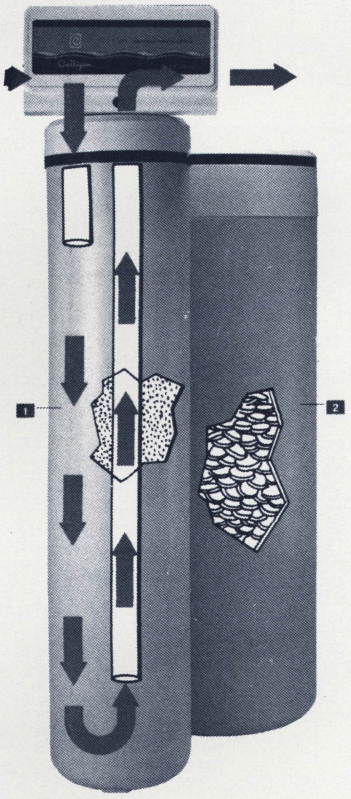
Municipal water softening—Some water utilities offer municipal softening, but municipally softened water falls short of being soft water. Municipal treatment is generally done in areas with extremely hard water, and the end water is still often in the hard to moderately hard range. Municipal softening is also inefficient because all the community's water is softened, including water that is ultimately used to water lawns and clean public streets.

Household water softeners—Household water softeners generally provide the most economically effective source of soft water for home and business use. A typical water softener works on the principal of "cation exchange" in which the ions of hardness minerals (an ion is an electrically charged atom or group of atoms) are exchanged for sodium ions, effectively reducing the concentration of hardness minerals in the water to insignificant levels.

As the water enters the softener, it passes over a resin bed in a special tank. The resin is made up of tiny synthetic beads that attract and hold sodium or potassium ions. The beads give up these ions in exchange for the hardness ions whenever they encounter them.

After a period of use, the sodium or potassium ions are completely exchanged and the unit has to be "backwashed" or "regenerated" to recharge the resin beads with sodium or potassium ions. Recharging requires the use of sodium or potassium chloride loaded into a "brine tank." The sodium or potassium salt dissolves in water to form a brine, which recharges the system.

Recharging is generally done by one of two methods. Automatic softeners start recharging on a set time



Softener mechanics. Hard water flows through a tank filled with synthetic resin beads (1). Millions of sodium ions are loosely attached to each bead. The water exchanges its "hardness" ions, mostly calcium and magnesium, for the "soft" sodium ions and flows on to the faucets. When the resin is saturated with hardness ions, it must be regenerated in order to work again. Salt water from a brine tank (2) flows through the resin. The resin gives up its mineral ions in exchange for sodium ions. The brine goes down the drain. From *"Fit to Drink?" Copyright 1990 by Consumers Union of United States, Inc., Yonkers, NY 10703-1057. Reprinted by permission from Consumer Reports, January 1990.*

cycle according to anticipated need. The Demand Initiated Regeneration (DIR) process uses a meter or sensor to monitor the actual hardness levels of the water or the amount of water the unit has processed and regenerates the unit as necessary.

Water softening and drinking water

Use of sodium ions in water softeners does not make the water noticeably salty or cause a significant increase in a person's sodium intake. A person who drinks eight 12-ounce glasses of softened water per day (softened from 20 gpg) takes in less than 10 percent of his or her typical dietary sodium intake from this source. In fact, the Federal Drug Administration defines water that would result from softening 100 gpg hard water (where many more sodium ions would be exchanged than is typically the case) as a "low sodium" beverage. This level of sodium should affect only those individuals on a significantly restricted diet. People who feel they fall into this category should consult their doctor.

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Conclusion

Hard water can cost you hundreds of dollars in extra detergent, extra hot water, unnecessary rinse cycles, fabrics that lose their usefulness, and washing machines that wear out before their time. Soft water greatly reduces this waste and gets laundry cleaner as well.

Many of softened water's benefits apply to areas besides laundry. Bathroom and kitchen cleaning is easier, water heaters operate more efficiently and last longer, dishes get cleaner with less detergent, dishwashers last longer, and even bathing is free of the hard water deposits that dry out skin and dull hair. When it all adds up, hard water is an economic waste that can be done without.

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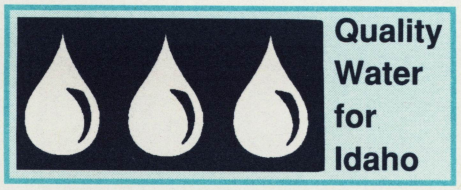
Acknowledgment — This publication was adapted from "Soft Water: The Economical Solution," in *Water Review*, volume 8, number 1, 1993, published by the Water Quality Research Council.



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