WQRF | Water Quality Research Foundation

BENEFITS OF REMOVAL OF WATER HARDNESS (CALCIUM AND MAGNESIUM IONS) FROM A WATER SUPPLY

The impact of softened or hard water (unsoftened) on the performance of household devices has been studied by two independent laboratories. The first study tested showerheads and 3 different types of water heaters fed with softened and unsoftened water under controlled laboratory conditions to quantify the performance efficiency. The study also calculated the effect on carbon footprint of unsoftened and softened water. The laundry study investigated stain removal with varying levels of hardness, detergent dose, and temperature. The detergent study investigated the relationship between hardness and detergent dose, and included tests for removing difficult soils in addition to the spot and film evaluation.

Showerheads

Showerheads on hard water lost 75% of the flow rate in less than 18 months of simulated normal operation. Faucets on hard water could not maintain the specified 1.25 gallons per minute flow rate because of scale collection of the strainers.[1]

Electric Water Heaters

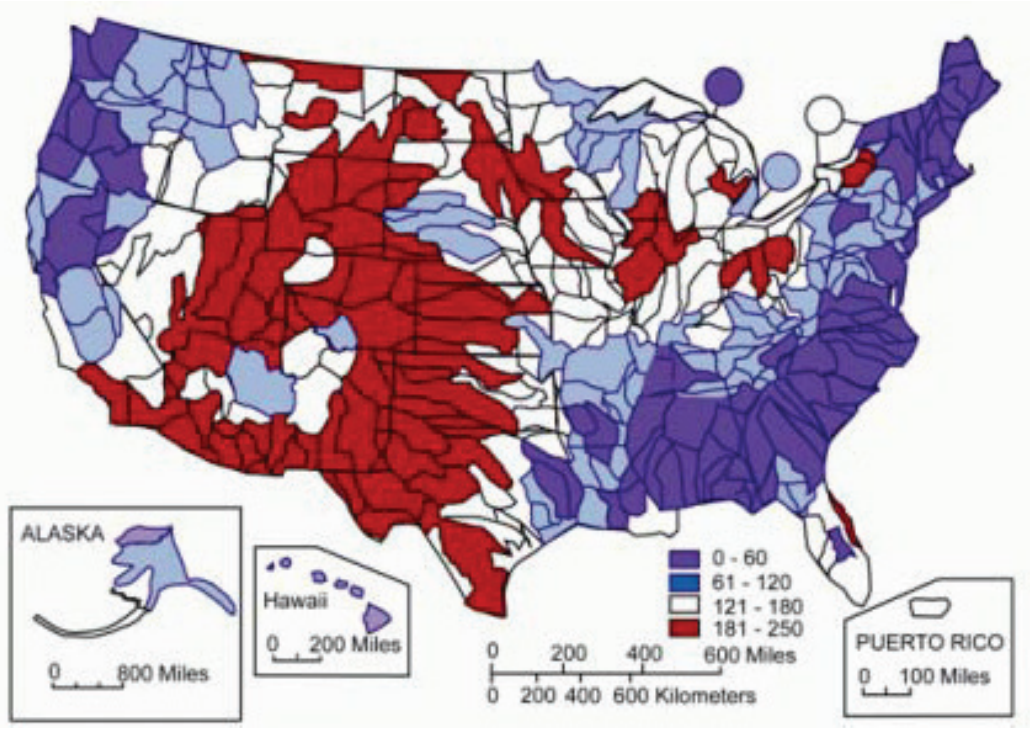
Up to 30 pounds of calcium carbonate rocklike scale deposits can accumulate in electric water heaters. Each 5 grains per gallon of water hardness caused 0.4 pounds of scale accumulation each year in electric storage tank water heaters.[1]

Gas Storage Tank Water Heaters

Each 5 grains per gallon of water hardness causes a 4% loss in efficiency and 4% increase in cost of energy in gas storage tank water heaters when using 50 gallons of hot water per day.[1]

Tankless Water Heaters

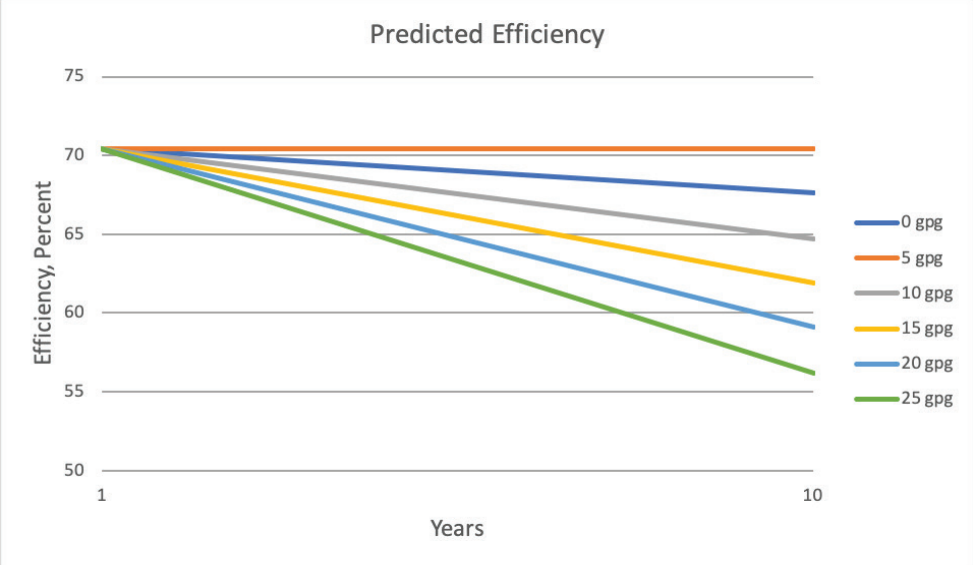
The economic savings of softened water with instantaneous tankless water heaters can lead to recovery of the cost of a water softener and operating supplies in a period as short as a year. Softened water saves 40% of costs compared to operating on 20 grains per gallon of water hardness and saves 57% compared to operating on 30 grains per gallon hard water.[1]



US Water Hardness
Concentration of Hardness as Calcium Carbonate, in Milligrams Per Liter

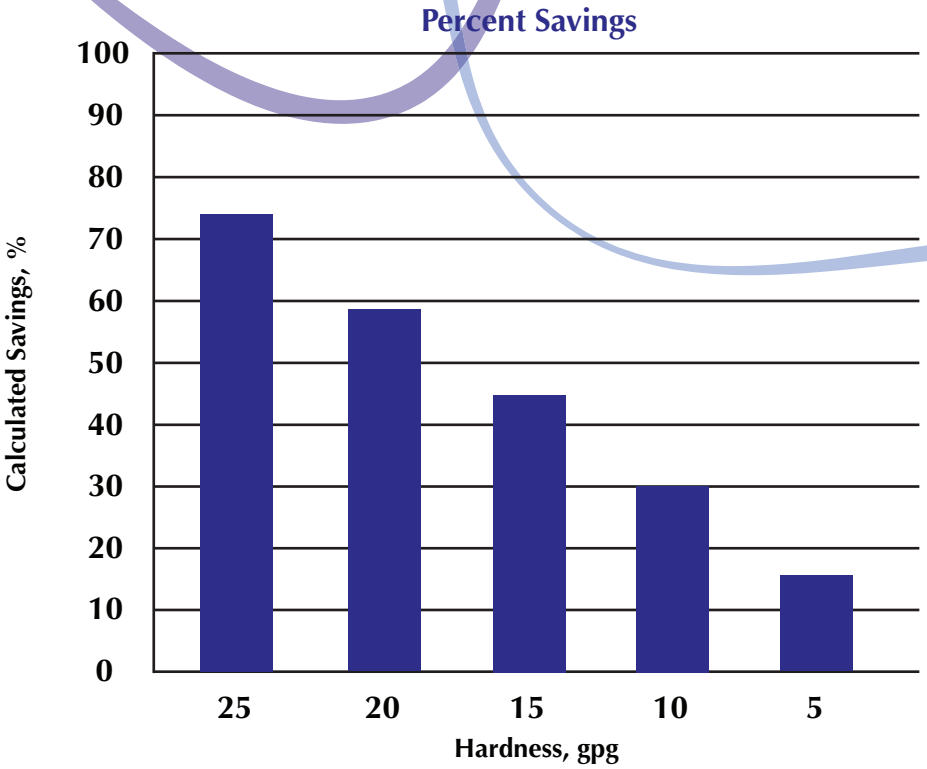
Carbon Footprint

The carbon footprint increases 18% for gas storage tank water heaters when operated on 26 grains per gallon of hard water for 15 years as compared to the same operation on softened water. For instantaneous-type natural gas water heaters, this same carbon footprint increases 4% when operated on 26 grains per gallon of hard water versus 0 grains per gallon of softened water over 15 years.[1]



Detergent Savings for the Dishwasher

Detergent savings up to 70% was observed for dishwashing when softened water was used compared to hard water. See the graph below showing the percent savings at each hardness level. Depending on the soil, hardness reduction was found to be up to 12 times more effective at soil removal than increasing detergent dose. Hardness reduction was ~6 times more effective at reducing spotting and twice as effective at reducing filming as increasing detergent usage.[2]



Detergent Savings—Laundry

Stain removal performance increases dramatically when hardness is removed even when dose and temperature are also lowered. Depending on the stain, hardness reduction was up to 100 times more effective at stain removal than increasing temperature or increasing detergent dose.[3]

Softening water will allow use of less detergent and save energy by lowering water temperatures while still maintaining or improving performance.

When water of any hardness is softened prior to its use in washing, the detergent use can be reduced by 50% and the washing can be carried out in 60ºF cold water instead of 100ºF hot water and achieve the same or better stain removal yielding whiter clothes.

References:

1. Gadkari, Paul et al. (2009) *Study on benefits of removal of water hardness (calcium and magnesium ions) from a water supply. Battelle Memorial Institute*. Columbus, OH.

2. Scientific Services. (2011) *Evaluation of the effect of water hardness on performance of automatic dishwasher detergents and savings possible by softening water.* Sparrow Bush, New York.

3. Scientific Services. (2011) *Evaluation of relative effects of hardness, detergent dose and temperature to evaluate stain removal efficacy.* Sparrow Bush, New York.

WQRF | Water Quality Research Foundation