

SaltGuru Video Transcript

Episode: 6 – Water Softening

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Hi, I'm Mort Satin and I'm the SaltGuru.

When most of us think of soft water, the first thing that comes to mind is soft, lustrous and easy to manage hair. Washing clothes in soft water leaves them softer and prolongs their use in addition to saving a considerable amount of detergent. Best of all you don't get that ugly ring of soil lining the bath tub. The ability of water softeners to get rid of hard water minerals has been known for years and in addition to the health and cosmetic benefits, they have contributed greatly to eliminating plumbing maintenance costs associated with scale buildup.

Well, what actually is water softening and how is it carried out? Water softening is the process of reducing the dissolved minerals calcium, magnesium, manganese and iron ions concentration in hard water. These metal ions react with soaps and detergents, hindering their ability to foam up and also causing a soiled precipitate—that familiar "bathtub ring" - yuck. The calcium and magnesium also precipitates out as hard deposits on the surfaces of pipes and heat exchangers. Finally, the hardness minerals lead to galvanic corrosion which can rust out plumbing. So obviously the goal is to remove those hardness minerals and the appliance that best does this is an ion exchange resin water softener.

The process is actually quite simple. The hard water to be treated is passed through a bed of ion exchange resin. Negatively-charged resins absorb and bind hardness ions, which are positively charged. The resins initially contain sodium ions, which exchange with calcium and magnesium ions in the hard water. As the water passes through the resin column, the hardness ions replace the sodium ions which are released into the water. The "harder" the water, the more sodium ions are released from the resin and soften the water.

As the resin beads become loaded with the undesirable hardness ions, they gradually lose their effectiveness and must be regenerated – a process that is accomplished by passing a concentrated sodium chloride solution through them so that they return to their original state. The waste water is then flushed out of the system. Most water softeners have metered control devices to minimize the frequency of regeneration.

However, like so many other things these days, the water softening waste release has come under fire from certain environmental quarters, even

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though it has not been proven to be a problem under most practical conditions. In response to these concerns, the Water Quality Association decided to study the environmental impact of conventional water softening. The goal of the study was simple, to determine whether ion exchange water softening is an eco-friendly technology that might be able to contribute to the efficiency of home heating technologies and result in a reduced carbon footprint. In order to carry out the study the prestigious Battelle Institute in Columbus Ohio was contracted to do the work.

The study design was simple and fairly straightforward. It focused squarely on testing the impact of softened water on the life and energy use of appliances commonly used in all our homes. Scientific tests on heating efficiencies of gas-fired water heaters, electric water heaters, and tankless water heaters. In addition, accelerated tests on longevity and maintenance of these heaters were carried out, in addition to analyzing the impacts soft water on plumbing fixtures such as showerheads and faucets and home appliances such as washing machines and dishwashers.

As you can see from the photograph there was a very wide range of equipment employed in the study carried out at the Battelle Institute. There were large electric storage water heaters, natural gas storage water heaters and the newer indoor instantaneous water heaters. The results of the studies showed that with softened water, gas and electric water heaters maintained the original factory efficiency rating over a 15 year lifetime, but with hard water, there was as much as a 25% loss of operating efficiency of the water heaters – an incredible difference in energy utilization. With soft water, indoor instantaneous gas water heaters (or tankless heaters) maintained the original factory efficiency rating over a 15 year lifetime, while on hard water the heaters completely failed to function because of plugged up scale in the plumbing after only 1.6 years of equivalent hot water use! About one tenth the useful life of the appliance! Furthermore, softened water saved anywhere from 40 - 57% of costs compared to operating on hard water.

When tested on showerheads, soft water maintained a brilliant luster on the finish and a full stream flow. Faucets on softened water performed perfectly throughout the study; as if they had just been installed. With hard water, showerheads scaled up and lost 75% of their flow rate in less than 18 months. Faucets on hard water could not maintain their required flow rate because of scaling. The strainers on the faucets using unsoftened water were almost completely plugged after just 19 days of testing.

It is interesting to note a very recent publication in the Proceedings of the National Academy of Sciences entitled, "[Opportunistic pathogens enriched in](#)

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[showerhead biofilms.](#)” This paper describes the potential for scaled up showerheads to harbor pathogenic microorganisms that cause pulmonary problems. Without scale buildup, these microorganisms do not have a chance to anchor in and grow - they simply get washed away. Scale-buildup provides them with a comfortable home. It is particularly interesting to read the final conclusion of the authors, “We conclude that showerheads may present a significant potential exposure to aerosolized microbes, including documented opportunistic pathogens. The health risk associated with showerhead microbiota needs investigation in persons with compromised immune or pulmonary systems.” Another benefit of softened water.

Back to the Battelle Study. These photographs tell the story of differences between softened water and hard water on the operation of appliances such as dish washers and washing machines. Just look at the difference between the two. Not only does softened water do a better job, but it becomes immediately apparent that the wear and tear on the machines is a lot less with soft water.

Here you can see the impact on a laundry tub. Look at the buildup of minerals from the hard water machine.

The net results of this study proved, beyond any doubt that by maintaining a high level of efficiency, home water heaters, faucets, showerheads, and various appliances will use significantly less energy, resulting in a dramatically decreased carbon footprint. Appliances will last longer, also contributing to less waste and land fill and finally improved health by eliminating scaled surfaces that could harbor pathogenic bacteria.

Water softening – it’s good for you and it’s good for the environment.

This is the SaltGuru saying goodbye for now.



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