

SUBJECT: CORPORATE TECHNOLOGY

TECH CENTER BULLETIN 61

Inter-Office Correspondence

Subject: The Effect of Water Softeners on Water Heater Lifetime Performance

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The use of water softeners in hard water areas and even moderately soft water areas is becoming a common occurrence. This practice has a potentially detrimental effect on the performance of the anode in the water heater which can cause a reduction in the life of the water heater.

Scale caused by hard water can result in clogged pipes and a water heater with reduced recovery efficiency. Washing, bathing and shampooing in hard water leaves a film and solid particles on the skin. The problems are caused by insoluble cations in the water. The predominant cations in water are calcium and magnesium. Water softeners work by exchanging soluble sodium ions for the insoluble calcium and magnesium ions. This process is called ion exchange and is performed by a substance called zeolite. The zeolite is precharged with sodium ions which attract the calcium and magnesium ions and exchanges them with sodium. Periodically the softener is recharged with sodium by running salt (sodium Chloride) through the zeolite resin bed. This process is called back washing.

The water softening process can cause problems. Several effects on the water heater are described below:

- Sodium reduces the hardness of the water but it does not reduce the conductivity of the water. Excessive conductivity in the water will accelerate anode performance resulting in more rapid anode consumption.
- If the resin bed of the softener is not properly rinsed after recharging with salt, residual salt will get into the water heater. This will increase the conductivity of the water and result in more rapid anode consumption.
- Water softeners accelerate anode consumption because they eliminate the formation of scale in the water heater tank. Light scale formation in a water heater is desirable since it forms a barrier film on the exposed steel surfaces in the tank such as pipe connections and weld areas. Corrosion cell tests at the Corporate Technology Center have shown a steel corrosion rate drop of 33% with the formation of a thin (<1/16") film of scale after only three weeks in moderate conductivity water (17 grains hardness).

Customers using water softeners should expect more rapid anode consumption. Anodes should be inspected more often and replaced when nearing the end of their useful life.