



Water Softeners as Energy Conserving Investments

RESEARCH REPORT

“Softened Water Energy Saving Study-Controlled Experimental Testing Program on Household Water Heaters”
New Mexico State University

PURPOSE

The purpose of this study was to measure and quantify differences, if any, in energy consumption of household water heaters installed and operated on hard versus softened water supplies. The objectives were to determine if softening water saves energy in gas and electric hot water heaters, and to determine how accumulated scale and sediment in heaters affects energy consumption.

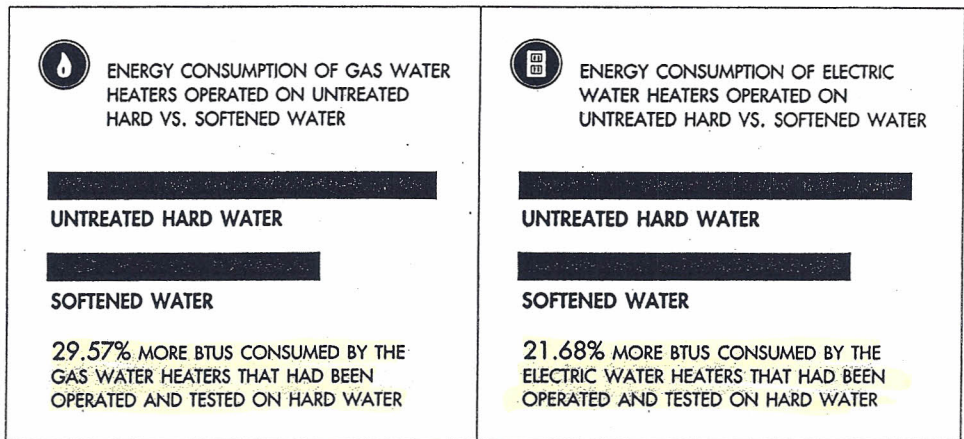
TESTING

The NMSU study was performed in the laboratory on 16 water heaters: four new heaters and 12 heaters removed from actual households in the Las Cruces, New Mexico area. Used heaters were selected to obtain a broad range of in-service-time, from five to 15 years, and varying amounts of sediment-scale deposits. The test groups were chosen so that half of each group had been operated exclusively on the area's untreated hard water; and the other half of each group had been operated exclusively on water from the same water source but which was first softened by home water softeners to remove hardness minerals. The energy consumed by each water heater was monitored at the NMSU labs for 14 days under typical residential hot water usage patterns.

RESULTS

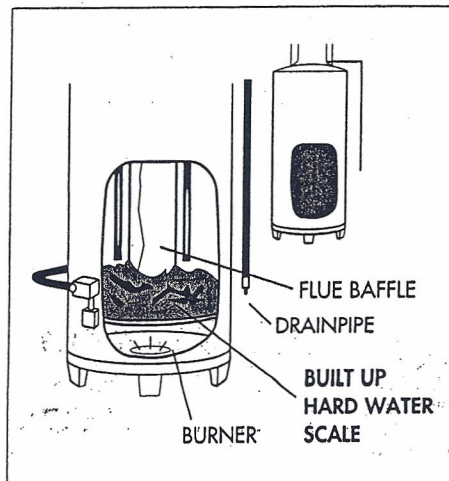
Gas Water Heaters - in terms of additional energy consumed, the group of used heaters on hard water took 29.57% more Btu's than the group on softened water to provide the same amount of hot water.

Electric Water Heaters - In terms of additional energy consumed, the group of used heaters on hard water took 21.68% more Btu's than the group on softened water to provide the same amount of hot water.



OBSERVATIONS

The major reason cited by the NMSU researchers for the energy usage differences is simply the application of the principle of insulation...but in reverse. In this case, hard water can contribute to the buildup of a



layer of insulation (in the form of scale) between the water and the heat source. Scale acts as an insulator and is a poor conductor of heat.

The problem this poses for water heaters is that when such a scale and sediment builds up in the heater tank, it insulates the water from the heat source being used to heat it [see illustration to left].

In order to heat the water in such a situation, it is first necessary to heat the scale that has built up in the tank. The energy used in heating this scale is largely wasted. As a result, water heaters with such a scale build up work harder and use more energy to deliver a given amount of hot water than heaters which do not have the handicap of this unwanted hard water scale.