Is Hard Water Sapping Your Energy?

By Mike Pederson
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Many business owners and managers are well aware of the problems caused by hard water—from clogged pipes and iron stains to spotty glassware and inferior drinking water. What they're not always aware of, however, is the impact of hard water on energy use and the associated costs.

In hotels there are several types of equipment that can be affected by hard water, in terms of impaired efficiency and wasted energy: boilers, hot water heaters, cooling towers, humidifiers, washing machines, dishwashers, and shower heads to name a few.

Let's take a look at how hard water affects the energy efficiency of boilers. Most municipal water supplies contain hardness ions that accumulate on heating elements and the internal surfaces of boilers. The scale buildup has an insulating effect that reduces the element's ability to heat the surrounding water. The boiler's thermostat continues to call for heat, so the element heats longer and more often. This causes wasted energy and high utility bills and ultimately causes the heating element to fail over time.

When impurities reach an unacceptable level within the boiler, the impurities need to be removed by a process typically referred to as "blow down." These impurities are flushed to the drain. Makeup water has to then be added to the boiler to replace the water that was lost. The result is waste of water and energy plus more wastewater to drain.

The Hard Costs of Hard Water

According to the American Society of Plumbing Engineers (ASPE), as little as 1/16 inch of scale can increase energy consumption by 11 percent. That means significant opportunity for savings. The prevention of scale formation, even on a small 500 hp boiler, can produce energy savings up to $30,000 per year.

Based on a study conducted at New Mexico State University, it costs up to 29 percent more to heat untreated water. The research report, "Water Softeners as Energy Conserving Investments," sponsored by the Water Quality Research Council, showed that 29.7 percent more BTUs were consumed by gas water heaters that had been operated and tested on hard water than those that were operated on treated water. A total of 21.68 more BTUs were consumed by electric water heaters that had been operated on hard water.

With hard water, more chemicals and detergents are needed for cleaning. For every grain of water hardness, detergent use increases 2 to 4 percent for each grain of hardness per 1,000 gallons of water used. An additional 1.5 pounds of detergent are required. That means increased costs for detergents and more wastewater with impurities going to the sewer. That is not good for your business and not good for the environment.

Why Soft is Better

The solution to hard water problems is "water conditioning," a term often used generically for water treatment. There are different types of water treatment solutions—softening, reverse osmosis, or filtration. A water treatment consultant will typically assess water usage, water chemistry and space availability to come up with a customized water treatment solution.

Staff at the Four Seasons Hotel in Dallas reduced scale in the hotel's boilers by 90 percent by installing a softener system and also reaped the benefits of a 30 to 35 percent savings in detergent and chemical use. For a typical restaurant that uses hard water, it costs $1,140 per month to heat the water (based on $38 per day to heat 4,000 gallons). Water softening can save as much as 30 percent—a cost savings of $342 per month, adding up to more than $4,000 in savings annually.

Adding water treatment to the mix of other energy savings measures in your establishment can provide significant benefits: protecting your investment in energy-saving equipment; improving equipment efficiency; increasing your chances for an energy-related government tax break; and helping to protect the environment.

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