



Soo~Soft™ Digital Water Softener Energy Savings



Lime Scale

Lime scale is one of the largest causes of wasted energy in the world. Its effects are as common as water itself. Wherever water is heated, evaporated, or undergoes a change in pressure, lime scale is deposited on surrounding surfaces. It collects on surfaces and fouls them with hardened crystal structures that prevent heat from being transferred from one surface to another. This hardened scale is very difficult to remove. Scale build-up dramatically increases the energy cost for operating water heaters, boilers, heat exchangers, and plumbing systems in the home, commercial businesses, and industry. It is an excellent insulator causing inefficiency and wasting precious energy.



Good Earth Graphics / Dave Bunnell

Because the effects of lime scale are so pervasive, it is difficult to accurately gage the costs of the problems created. Estimates are in excess of 100 billion dollars in the U.S. alone. This is probably a very conservative estimate.

The main mineral that makes up lime scale is calcium. Calcium has been dissolved into all the water sources in the world through the remains of countless land and sea animals over hundreds of millions of years.

Just as rain precipitates from the air, calcium precipitates from water. Heat and pressure changes are the two largest causes of calcium precipitation. Anything that creates heat and/or pressure changes causes calcium to come out of the water. In addition, these particles of calcium contain an electrical charge causing them to be attracted to metallic surfaces. The insides of pipes, water heaters, boilers, coffee makers and dishwashers provide the perfect surfaces to build lime scale.

Gas Heaters

Calcium forms scale in every water heater. It forms at the bottom of a water heater or boiler near the flame. The flame no longer can directly heat the water in the tank. It heats the calcium deposit at the bottom of the tank first. The heated calcium then heats the water. Studies of water heaters indicate that ¼ inch of scale can increase fuel consumption by as much as 40%. In cases where the scale builds up to 1 inch, a 95% reduction in heat transfer results.

Electric Water Heaters

Calcium builds up on the outside of the heating element. Again, the calcium deposits are heated first, and the calcium then heats the water. The electrical heating element is then forced to work at a much higher temperature than its design parameters. It fails long before its time. In water that is high in calcium, heating elements in electric water heaters, boilers, and coffee makers can build an inch of hardened scale in just a few months.



Temperature sensors with calcium deposits add to the problem. The sensor becomes thermally insulated from the water, masking the actual water temperature. This causes the control system to demand more heat from the element. In addition many sensors have their own heating element built in. Calcium deposits causes these elements to demand more energy than required and causes them to fail prematurely due to trapped heat.

Plumbing & Pumps

Lime scale also collects inside of pipes, pumps and radiators, causing a greater resistance to the flow of water through the plumbing and heating system. This added resistance forces the pump to work harder in order to maintain water flow. The end result is higher consumption of electrical power to operate the pump and shortened life span of the pump.

The Costs

The economic costs are both direct and indirect. Radiators clogged with scale do not transfer heat well and consume more energy. Energy costs for operation of appliances, hot water heaters, boilers and pumping equipment are significantly increased. The amount of cleaners, soaps, and chemicals used for cleaning scale from drains adds to the costs. Other costs of lime scale are more deductive and often taken for granted. These include the cost of maintenance and replacement of all appliances that use water. From coffee makers, ice machines, water heaters, dishwashers, to hot water boilers used for heating, the costs for lime scale deposits are high.

ER Ratings

Energy ratings listed on water heaters, boilers, dishwashers, etc. are misleading. They demonstrate the energy costs for one year. The dollar amounts referred to are for brand new unit that has no calcium deposits. Depending on the calcium content in the water these numbers can often be doubled in as little as six months.

Environment

Carbon dioxide is the end result of energy usage. The current concern over climate change indicates that regulations will be instituted around CO² releases into the atmosphere. The more

efficiently we use energy, the less carbon dioxide generated. In addition, the reduced dependence on strong chemicals such as lime scale solvers and drain cleaners will further ease the pollution level of our water supplies.

Salt Softeners

Historically, hard water has been treated by salt-based systems that work on a principal called ion exchange. A portion of the calcium ions is exchanged for sodium ions. One problem is that this process is not complete. A new salt-based system typically removes about 75% of the calcium from the water. An older unit will often perform at less than 40%. In any case, the balance of hard calcium left untreated makes its way into the plumbing system and forms hard deposits. This often requires the use of acid de-scaling agents to attempt to keep these deposits in check. Additional problems are the effect of salt on the taste of water, the effect of additional sodium on our bodies and the impact of the brine discharge residue on our environment.

Dissolving Calcium Deposits

Until recently, water treatment by electronic or magnetic methods has been inconsistent and misunderstood. Magnets have been shown to be only marginally effective, because a flow rate of 2.3 (7.4 ft.) meters per second is required for optimal results. If the water flows at any other rate (faster or slower) the effects are significantly reduced. In the past, results from units that create magnetic fields electronically have also proven unreliable. Typically the problems have been low output power and limited frequency range.

The Soo~Soft unit is unique; using digital and amplification technology it is consistently effective both in its operation and in the results it brings. It does not remove calcium, but converts the calcium carbonate into a soft form called calcium aragonite. This form has a particle size that is about 4 microns. It has the constancy of a fine talcum powder and allows the water to become a much better solvent. The Soo~Soft unit also changes the electrical charge of the water, preventing the particles of calcium from sticking to surfaces. This treated water dissolves existing calcium deposits in everything it flows through in 90 days.

The calcium aragonite's very small size prevents it from reverting to a hard (carbonate) form unless the water is heated to over 700 degrees. This is well out of the range of any kitchen appliance including steam ovens. A 1-inch Soo~Soft home unit can process 30 gallons of water per minute. A 2-inch Soo~Soft commercial unit can process over 150 gallons of water per minute. This capacity treats the maximum amount of water that flows through the pipes. The 1-inch home unit produces over 4000 milliamps and the 2-inch unit is over 6000 milliamps of power. It is the most powerful unit on the market and it is both reliable and consistent.

The affects of the Soo~Soft unit are profound. In the 90-day period after installation lime scale is dissolved throughout the plumbing system. After the 90-day period of de-scaling, ice machines, coffee makers, steam tables, steam ovens and other appliances are kept free from deposits. The grief of lime scale deposits in equipment is over. Lime scale no longer forms in sinks, toilets, and bathtubs. Drains are cleared of calcium deposits. The effectiveness of soaps, detergents and other chemical agents used for cleaning increases as much as 60%. Housekeeping labor is reduced with the absence of lime scale deposits. In industrial and commercial applications the cost benefits of the Soo~Soft system are proportional to the amount of energy that is being consumed in heating, cooling or plumbing of water. The cost benefits can be profound and add greatly to the bottom line of any business.