



Fighting Scale:

**PREVENTION IS
THE BEST CURE**

by Jess C. Henderson

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Scale and hard water can kill or cripple hot water cleaning systems.

In most cases, and particularly where water is more than moderately hard, scale will build up inside a hot water machine's heating coil. As the water is heated, impurities—including calcium, magnesium, chloride and silicates—precipitate out of the water and form deposits, called scale, on the inside of the coil.

Not only does scale restrict the flow of water through the coil, it is an excellent insulator and its buildup will significantly reduce the coil's efficiency as a heat exchanger. Since the coil is not passing heat on to the water, the outside of the coil can, in the words of one steam cleaner veteran, get "hotter than the hinges of hell." The cleaner may seem to operate in a normal manner but the water will not reach previous temperatures. A loss in output water temperature may result from scaling.

Checking for scale buildup is simple. Remove the high pressure discharge hose from its fitting and visually inspect the inside of the fitting for a white mineral deposit all the way around the inside of the fitting; the thicker the deposit, the more serious the scale buildup problem. (Note: Scale buildup inside the coil may be thicker than the scale deposit in the outlet fitting.

Weapons in the War on Scale

There are several weapons which can be used in fighting scale, ranging from electronic devices through chemical softeners and, as a last resort, acidizing or flushing the heating coil and pressure hose with an inhibited acid solution. Cleaning chemicals can either contribute to or help prevent scaling.

In some cases, the bulk of scale deposits consists of cleaning chemical deposits. In this case, very little of the scale will be the result of mineral deposits precipitating from hard water. Using a cleaning chemical that reduces this

buildup goes a long way toward reducing the need for descaling procedures. A cleaning chemical formulation can include water softening agents which reduce calcium and silicate deposits.

Proper care of equipment, including use of scale-reducing cleaning chemicals and a water softening or pre-treatment device, may be the most economical approach to solving or controlling scale problems. In areas where hard water is a problem, distributors can enhance profits and satisfy customers by coming up with effective scale fighting solutions. Some European-designed hot water cleaners come with a water softening system as standard equipment.

Although scaling is a simple problem, solutions to scale can involve some pretty complex chemistry. One solution to the problem is an after-market scale prevention system which adds small quantities of sodium hexametaphosphate to cleaning systems to inhibit scale formation.

Magnetism is employed in other after-market scale fighting systems. This approach is used in the food service industry.

Fighting scale can be a profit center for distributors. One Chicago-area distributor said he had been very successful in marketing scale fighting systems at about \$300 per unit. With tightening environmental regulations, scale fighting techniques which prevent scale buildup in the first place will become more desirable because the alternative involves the periodic use of toxic acids to remove scale deposits.

Acid: The Final Solution

Running an acid solution through the coil is a solution for scale buildup developed in the early days of steam cleaning. Since water in a steam cleaner is heated to 325 degrees Fahrenheit and beyond, impurities precipitate out faster and scale can be more of a problem than in a hot water high pressure cleaner. The acid descaling

process can be time consuming and expensive and involves potentially dangerous chemicals. If done improperly, acidizing can literally eat up a coil from the inside outward.

Under normal operating conditions, scale can be removed periodically by short-term circulation of acid, sometimes called "proofing." This won't remove major scale buildup, but it will remove scale buildup due to

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cleaning chemicals rather quickly. However, use of acid should be avoided whenever possible.

Scale can be a serious problem in a hot water machine in hard water areas, and the choice may be between scale removal and coil replacement. A customer who has a serious scale problem is a prime prospect for a scale prevention system.

Pointers for Scale Removal

If scaling has progressed to the point where scale removal is necessary, there are several important points to remember.

Descaling should only be done by experienced service personnel. After all, even if it's diluted, it's still acid.

If possible, a descaling pump rather than the machine's water pump should be used to circulate water through the coil. Many older steam cleaners used diaphragm pumps because they are good acidizing pumps with little susceptibility to acid damage. If the cleaner's high

pressure water pump is used, the parts that come into contact with the acid solution should be checked for damage and replaced if necessary.

The proper kind of inhibited acid for descaling should be used. Generally this is a self-inhibited acid, or one that does not attack the metal but confines its activity to the deposits inside the coil. A seven-percent hydrofluoric acid solution is considered to be "heavy duty." Acid purchased from swimming pool supply houses is not inhibited and should not be used. Stainless steel coils need special treatment, since even inhibited hydrochloric and hydrofluoric acids attack a stainless surface.

After use, the coil acid should be neutralized with an appropriate base, and never just be dumped down the drain. Approved disposal methods for used descaling solution should be determined by checking with local regulatory authorities. Acceptable disposal methods may vary from one jurisdiction to the next. One should dress for the occasion, wearing protective clothing and goggles to keep acid from contact with skin and eyes.

Always descale in a well-ventilated area. Descaling requires the use of strong acid and alkaline chemicals. Protect eyes and exposed skin areas from splash and splatter. Wear eye protection. If chemicals come in contact

with skin or eyes, thoroughly flush with water and see a doctor immediately.

Proofing a coil by running a gallon of acid solution through the coil simply widens the narrowest spots in the scale deposit, but does little to solve the insulation problem if a thick, hard water scale is present.

Hard Water

In addition to causing scale buildup, hard water can decrease the effectiveness of cleaning chemicals, and cause water spotting on cleaned surfaces. Hard water is water containing certain dissolved minerals, primarily calcium and magnesium compounds. In other words, hard water is essentially water containing dissolved rock.

Hardness is generally measured in grains per gallon of hardness (calcium and/or magnesium). A grain of hardness is 17.1 parts per million of dissolved minerals. Water of moderate hardness contains from 60 to 181 parts per million of the specific dissolved minerals which contribute to water hardness. This is about three to ten grains of hardness.

Most water in the United States falls in the moderately hard category. Figures prepared by the United States Geological Survey show that the average hardness of water in the United States is 121 ppm or 7.1 grains of hardness.

Besides reducing the effectiveness of cleaning chemicals by 30–250

percent depending upon the chemical, hard water can cause serious scaling problems, particularly in hot water equipment. Heating water causes the dissolved minerals to precipitate out, forming rock-hard deposits of scale inside the equipment, particularly the coil.

Scale in the heating coil both restricts and insulates the coil. A one-eighth inch scale deposit can reduce heating efficiency by 30 percent. If scale buildup is allowed to continue unchecked, the coil can become completely blocked and will have to be replaced.

Removal of scale can be accomplished by circulating a solution of inhibited acid through the coil. The acid attacks and removes the scale buildup. This descaling process should only be attempted by or under the direction of a service technician or damage to the system may result.

Hard water problems can be reduced or prevented by chemically softening the water. Softened water allows for more effective detergent action. The phosphates in many detergents act as water softeners and help these detergents act more effectively in hard water. Whatever approach you take, the best solution to scale problems is prevention rather than resorting to acid for scale removal. *CT*

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