

# Scaling can sap energy, maintenance time

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*Scalewather North America Inc.*

Boil a kettle of tap water in a hard water area and two undesirable observations are made: A fine but harmless scum appears on the surface of the water and a hard white encrustation develops on the heating element. The latter is calcium carbonate and is usually referred to as limescale.

The limescale that deposits on the heating element will, if untreated, reduce the efficiency of the kettle, induce corrosion of the element, and ultimately lead to appliance failure. However, it is not just domestic appliances that are affected; boilers and steam generators also develop limescale deposits, which will cause similar problems if left untreated.

Limescale can form wherever water is heated. The reason for the problem is that source waters (potable or ground water) contain dissolved mineral salts,

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sometimes described as hardness, which have low solubility in the water. When heated, the water can no longer hold these salts in solution and deposition must then occur.

## What can go wrong?

Deposits are an insulating layer on heat transfer surfaces. This leads to more power being consumed or to the need to install heavier duty equipment to compensate. It is estimated that 40% more energy is needed to heat water in a system fouled with 1/4-in. of limescale.

Scale in water lines reduces the available cross-section area and the throughput. Eventually the line will become completely blocked. Equipment then needs to be shut down for cleaning, and this costs money.



When water is heated, limescale can occur. This problem can clog pipes, reduce energy efficiency, and cause equipment failure. Courtesy: Scalewather North America Inc.

Safety valves or emergency process sensors (e.g., that operate deluge systems) may not operate in an emergency. Overheated boilers can be dangerous.

Stagnant conditions can develop in void spaces beneath deposits, and this encourages corrosion of steels and other metallic surfaces. The results can be fluid leaks and equipment failure, which is potentially dangerous. Scale surfaces are also excellent growth sites for bacteria, which can create conditions hazardous to health (e.g., production of legionella pneumophila).

In order to establish if you have a problem, try answering these questions:

- Do appliances such as water-fed equipment contain white scale?
- Are there signs of unexpected deposit formation around valves or at the pipe outlets?
- Are boilers/heat exchangers performing below design?
- Is corrosion a problem in the plant?
- Is the water throughput less than expected?

The more times that the answer is “yes,” then the more likely it is that you have scale.

## Solving the problem

If some means can be found to control scaling, there is potential to save energy, prevent equipment failure, reduce maintenance, and save money.

A range of physical methods can be used to remove fouling deposits. Water jetting, or sand or plastic-bead blasting can be used in accessible locations. However, such methods can be expensive and abrade surfaces.

Magnetic and electronic descaling does not stop precipitation but it alters the shape of the crystals to reduce the adherence and buildup of deposits on the pipewall. Perhaps the most remarkable observation is that devices can affect descaling downstream of the point of installation; a softening and loosening of existing scale several weeks after installation is commonly reported.