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PERSPECTIVE

Descaling without acids

PREVENTING SCALE FORMATION IN WATER SYSTEMS AND REMOVING EXISTING SCALE DEPOSITS CAN HAVE A COMMON SOLUTION, AS **JONNY SECCOMBE** EXPLAINS.

The capabilities and shortcomings of many of the currently available physical water conditioners are now commonly appreciated, but less well known and often surprising to many engineers is the capability of some of these products to reduce, and sometimes totally clear, existing scale from plant and equipment that has been exposed to hard water over a period of time.

Traditional methods of treating scale-encrusted appliances range from scrapping and total replacement to time-consuming chemical descaling using acid in some form or other. Apart from the downtime and health hazards involved with using acids in water-handling plant, an undesirable side effect of acid washing is the unavoidable etching of the metal where scale has formed. The irony is that scale is attracted to rough surfaces, and that is exactly what the acid wash creates once the scale is dissolved. When the plant is returned to normal usage, scaling can be expected to occur much more rapidly than before.

As an alternative to traditional descaling methods, it is now becoming more widely appreciated that some of the electronic water-conditioning systems are capable of rapid and effective descaling without any further intervention. Although there are a number of well documented field studies that provide sufficient evidence of the effectiveness of these water-conditioning products, the exact mechanisms by which this is achieved are not fully understood.

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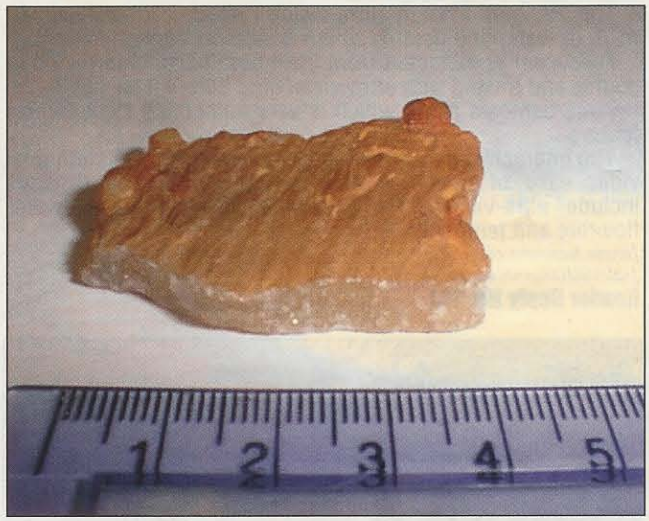
One hypothesis is based on the premise that scale is seldom in a stable form. Changes in pressure, temperature and water quality are continuously causing elements of the encrusted scale to dissolve back into the water, but normally fresh scale will deposit to take its place. However, where the water is treated with a suitable device, the fresh scale forms in the body of the water as suspended particles and not as an encrustation on the surfaces. Gradually, the old scale will erode from the surface in contact with the water.

Normally this process would take a very long time to remove all the limescale, but what is unusual about electronic water conditioning is the way that the scale breaks away quite rapidly. After only a few weeks, it is common to find that all the scale has broken away as plates, leaving the underly-



Electronic water conditioning can cause encrusted scale to break away in large lumps, for easy removal by manual cleaning.

Following three months of electronic water conditioning of the domestic-hot-water services , the downtime to remove scale from this 1500 litre calorifier was around six hours.

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ing surface almost entirely scale free. It seems that the dissolving scale weakens the whole matrix of the scale deposit to such an extent that it breaks away from the back surface in a plate form.

An example of what can be achieved is evidenced by some work carried out on the P&O cross-Channel ferry *Canterbury*, where Water-King units were installed to provide partial softening. The domestic-hot-water services were being provided by a 1500 litre calorifier, which, in spite of annual dry docking when some acid washing was carried out, over a period of years had accumulated about 7 mm of encrusted scale on the internal surfaces of the tank. Within three months of installation of a Water-King WK3 on the 54 mm cold feed to the calorifier, most of the encrusted scale had broken away and fallen into the bottom of the calorifier. Lumps of scale 7 mm thick and 4 cm square lay in the bottom of the tank, from where it was easily removed by manual cleaning. The downtime for scale removal was around six hours.

Independent research

The speed with which the process can occur is also well documented by independent research carried out by TFW Associates on a house in Portsmouth. The level of residual calcium bicarbonate in the hot water of a domestic heating system was measured weekly after the installation of Water-King. The base value of the cold-water inlet was 150 ppm, which dropped to 100 ppm with normal heating and no water treatment.

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After installation of the electronic water softener, the level rose progressively to peak at 152 ppm after four weeks before declining rapidly to less than 50 ppm for the last seven weeks of the trial. These results indicate that the descaling process took place within the first five weeks after installation of the device.

Whilst the scale that breaks away from inside a calorifier causes few problems as it settles in the bottom of the tank, scale breakdown within hot-water-service pipes has the potential to cause blockages, especially in shower heads and thermostatic mixing valves. The benefit of being able to effectively descale a complete hot-water system without any downtime must be tempered with the caution that vigilance against full and partial blockages is essential. Strainers and filters need to be reviewed, and loose scale removed if flow rates deteriorate. Certain types of heat exchanger, such as those with a heat store and small-bore domestic feed, can become completely blocked as the scale breaks away within the small bore supply. For these we recommend a chemical descale before an electronic water conditioner is fitted.

In spite of these drawbacks, the benefits of non-chemical descaling are very considerable, and a plant that would otherwise be considered only for scrap, can be rescued and have its effective life prolonged. Having completed its initial descaling task, electronic water conditioners can go on to provide continuing scale protection and, even, partial water softening as well. All these benefits are realised at a cost considerably less than traditional water softening.

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