

# Retrofitting for scale removal

BY JONNY SECCOMBE

## Aqua-Rex system

Calcium scale in plumbing systems and water heaters is a common problem in areas where hard water supply is prevalent. Reduced flow rates, pressure loss and poorly performing water heaters are all system issues caused by scale adhering to surfaces. Pumps have to work harder and the insulating effect of scale on heat exchangers results in significant energy losses. In many



in the U.K. and now commonly used in the U.S., was installed upstream of the valve. The technology uses a radio transmitter to generate ultra high frequencies that are transmitted into the water by pairs of antenna wrapped externally around a water pipe. These radio signals cause nucleation seeds to form in the water, which then attract the scale, thus causing it to form as a fine suspended particle in the water rather than encrusting surfaces. A side effect of

cases, plant and plumbing fittings perform so badly that complete replacement appears to be the only option. Chemical cleaning may be considered, but increasing attention is being given to non-chemical alternatives such as physical water conditioners (PWCs).

### Scaling problems

A striking example of the problems that can be caused by scaling and how they can be resolved using a PWC was recently documented in a major hotel resort and casino in Las Vegas. Scaling of butterfly valves and check valves is an endemic problem in Las Vegas, given the prevailing water supply. This hotel had recently experienced a major flood due to a broken

fitting that could not be shut off because the relevant valve was jammed open with scale.

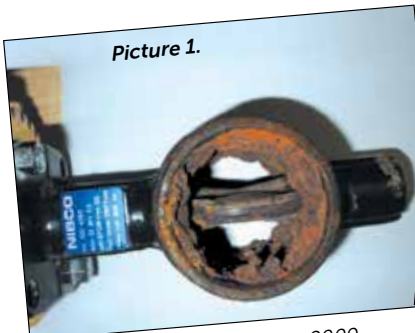
Picture 1 shows a typical inoperable butterfly valve in the hot water supply. The valve is inoperable and jammed in the open position. The scale has originally formed around the valve due to turbulence that has induced low pressure zones around the valve body. Scale precipitates when water is heated or pressure is reduced such as in turbulent flow.

To evaluate how a PWC could resolve the problem, the valve was re-installed on a cold water supply line with a strainer fitted downstream of it. An Aqua-Rex WK3 electronic PWC, a product widely specified for many years

this process is to cause the existing scale to break away from the surface where it has been attached. It literally de-laminates or exfoliates from an encrusted pipe or surface.

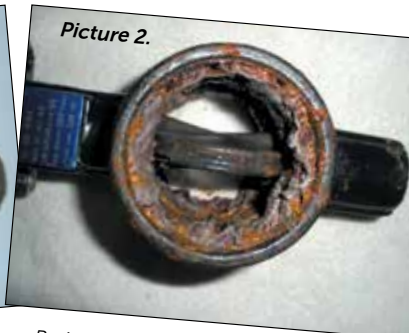
After seven weeks, the valve was removed for inspection. Picture 2 shows that the scale has changed character and a faint line can also be seen developing between the scale and the inside body of the valve illustrating the de-laminating process that is beginning. Some of the scale has clearly broken away but none of it was retained in the strainer. The valve was still inoperable. The valve was replaced in the line and the trial continued.

After another four weeks, the valve was pulled again, and Picture 3 shows that most of the scale had fallen out. During handling, the final



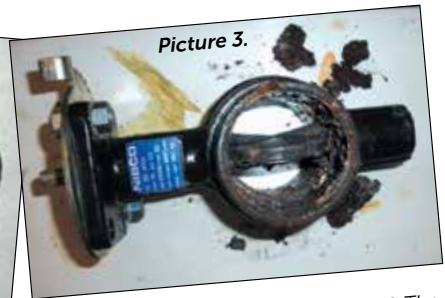
Picture 1.

In this photo taken in February 2009, turbulence has induced low pressure zones, and scale has originally formed around this butterfly valve, rendering it inoperable.



Picture 2.

By May 2009 the scale has changed character and a faint line is developing between the scale and the inside body of the valve, showing that the de-laminating process is beginning.



Picture 3.

Most of the scale is gone by June 2009. The final pieces fell out during handling, and the valve became fully operational again. This particular type of scale, common in Las Vegas, breaks down into a very fine powder and passes through strainers causing no associated problems.

pieces fell out and the valve became fully operational again. Inspection of the strainer revealed that none of the scale had been retained. It appears that this particular type of scale, common in Las Vegas, breaks down into a very fine powder and passes through strainers causing no associated problems.

The hotel, with an excess of 2,500 rooms, went on to install Aqua-Rex throughout the property. A few weeks after the install, the main supply shut off valves were pulled under a planned maintenance program as they had been mostly inoperable. They were now found to be de-scaled and working satisfactorily. None of the loose scale in the system caused any problems. An additional benefit was significant savings in plumbing fitting replacements such as showerheads and faucets. This alone recovered the cost of the installation within 12 months.

The scale break up into the plumbing system can cause problems. It can block aerators, plate heat exchangers and cause failures in water heaters. The characteristics of the scale can vary significantly from place to place depending on the water quality that give rise to the scale. In Las Vegas, it commonly breaks down into a very fine powder and passes through strainers, as it did in the case study quoted, causing few, if any problems. In other places where Aqua-Rex has been applied, the scale breaks down into plates about 1 inch across and 1/4 inch thick that have the potential to cause a hazard for certain types of mechanical plant such as heat exchangers.

The de-scaling effect can be very rapid. Within days of a unit being applied to a system scale can begin to break away and most of the scale will be released within about seven weeks. It is therefore very important to plan a strategy to deal with the scale as it is released into the supply system. Where tank type water heaters or hot water storage tanks are used it is not unusual for the lower section of the tank to de-scale quickly. But, it can take longer to break away from the upper portions of the tank over a period of months. Only a regular program of cleaning the tanks will determine how long this maintenance will be required in any particular water supply.

One of the unexpected things about using this radio wave technology is that the signals travel in both directions, upstream and downstream. This means that not only is water treated as it passes through the coils and then continuously

downstream of the unit, but water and scale upstream of the unit, some considerable distance away can also be treated and surfaces de-scaled.

An example of this effect was found in a spa in another hotel in Las Vegas. The cold water inlet to a steam generator on the 7th floor was treated with a single Aqua-Rex unit. A week later, a shower head on the 8th floor of the spa was found to have soft wipeable scale in place of the hard encrusted scale that was previously there. In order to treat the shower head, the signal had to pass through

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the water, down seven floors to the Plant Room, across the header and back up eight floors to the shower head.

As well as plumbing systems, the same technology can be used very effectively in swimming pools to remove and reduce scaling on pool walls and to reduce scaling on the surrounding decks. The same also

applies to water features such as waterfalls and sculptures.

In domestic water systems, this technology is tried and tested and very widely used. Variations do occur due to the make up of the water. While no limit to the calcium hardness has been discovered, very low levels of iron (Fe), less than 10 ppb, can reduce effectiveness, especially where combined with relatively high magnesium. In many cases, silica scale also seems to be unaffected by this technology.

In the vast majority of cases where calcium scaling is the main problem, the simplicity and ease of retrofitting this kind of equipment makes it a very attractive option both to rejuvenate old systems and to protect new ones. The cost of the installation in the first example was around \$80,000. This is a one off cost and will treat the property for at least 25 years with no maintenance or servicing at all. The electrical supply will cost around \$200 per annum. ●

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