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**JONNY SECCOMBE** CONSIDERS THE DIFFERENCES BETWEEN ELECTRONIC AND MAGNETIC FORMS OF WATER TREATMENT FOR PREVENTING THE BUILD-UP OF SCALE IN HEATING AND HOT-WATER SYSTEMS.

## Getting physical - the intricacies of electronic water conditioners

**E**xternally Fitted electronic water conditioners work on an entirely different principle to the well known intrusive 'in-line' magnetic system, but the two are often confused or grouped together as 'magnetic'. Intrusive magnetic systems have been around for many years, much longer than electronic systems, but the fundamental mechanisms by which the magnets work are only now being understood.

Current thinking suggests that magnetic systems rely on the release of corrosion by-products which act either as scale inhibitors or as nucleation seeds to stimulate the formation of non encrusting scale. The corrosion is caused by the direct electric current which is created by water flowing past the magnet. The system will only work when water is flowing, and its effectiveness is governed very much by the rate of flow of the water and thus the size of the direct current. When the flow rate is low or intermittent, the effectiveness of the system is much diminished.

The fundamental problem with these systems is that once the source of the corrosion by-products is exhausted, the process stops. Even before the source is exhausted, the effect can be greatly diminished because the source can become encrusted with other compounds already in the water, thus inhibiting the corrosion itself and ultimately resulting in 'passivity'.

It is generally accepted that when the in-line magnetic systems work at all, they generally have a limited, sometimes quite short, lifespan, after which they become ineffective. They then need to be replaced entirely.

## DIFFERENT PRINCIPLE

The more modern electronic systems work on an entirely different principle. They create a series of alternating currents in the water which interact with existing compounds already in the water to generate nucleation seeds.

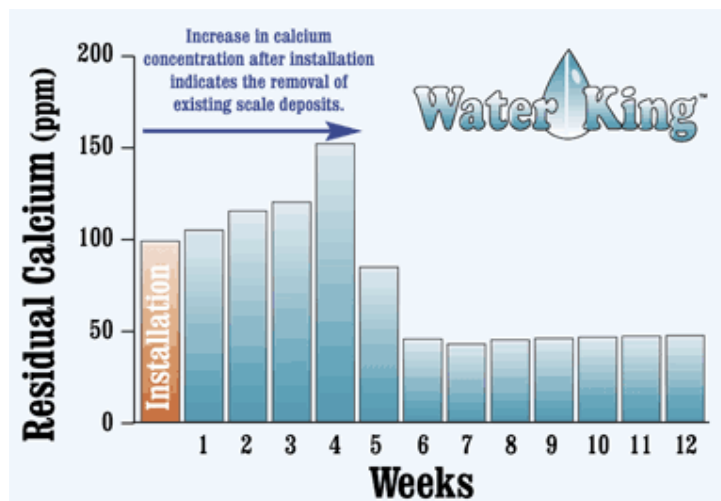
These seeds then go on to inhibit scale encrustation by stimulating scale formation in particulate form within the body of the water.

There are many different systems on the market which have a varying degree of effectiveness. Three key points govern their effectiveness.

- The complexity of the signal pattern and the consistency by which it is generated.
- The overall output power of the signal.
- The means by which the signal is transmitted into the water.

The most effective systems generate a complex wave pattern generated by a programmed microchip.

Our own program for the Water-King has been developed over the last six years as a result of intensive research with our end users. As most of our early customers were derived from our mail order business, we have been able to continue contact with them to establish the effectiveness of different products. Over the years we have continually refined the product from experience learned in the field and we continue this product improvement as we discover more about the processes involved.





Most systems currently on the market generate an output of around 5 to 9 V. The Water-King system generates a fluctuating signal with a peak output in excess of 80 V. Unlike magnetic systems the current from electronic systems is alternating and therefore does not cause corrosion or any of the byproducts associated with it. As the current is not dependent on the flow of water, static water can be treated equally as well as flowing water. This is a considerable advantage because water does not need to even pass by the unit to receive effective treatment.

The signal from electronic devices is transmitted into the water by one of three means. Most common is the closed-loop system where a wire comes out of the control box, around the pipe a few times and then goes back into the box. Some units employ a ferrite ring to transmit a powerful magnetic field and others, use open-ended aerials wrapped around the pipe. The attraction of the latter system is that one or more of the aerials can be attached to the pipe itself or to the water heater or place where scale is being generated - making the signal transmission very much more effective.

Some manufacturers claim that their systems are uniquely capable of transmitting the signal both upstream and downstream in the water. Obviously this is an erroneous claim as electricity cannot be forced to travel in one direction in a conducting medium such as water. The signal does decay with distance from the point of generation, and the closer the device is located to the point that scale forms, the more effective it will be. We know that our own product is more effective where there is conductivity. Plastic break tanks cause a loss in this continuity, but the problem can be overcome by cross bonding of the pipework or grounding one of the aerials of the unit across this break point.

## **EFFECTIVENESS**

Correct siting of the signal unit is also an important factor in improving its effectiveness. Pumps will interfere with signal transmission. If water is treated immediately prior to the pump, scale may be encouraged to form very rapidly

within any low-pressure area within the pump, causing it to seize up. We recommend that the signal generator should be fitted on the discharge side of the pumps.

Magnetic-based systems have had a long occasionally successful history of water treatment. It is clear that the modern electronic-based systems are far more effective in a wider range of applications for a much longer period of time, and in due course they will become the main form of non-chemical water treatment.

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