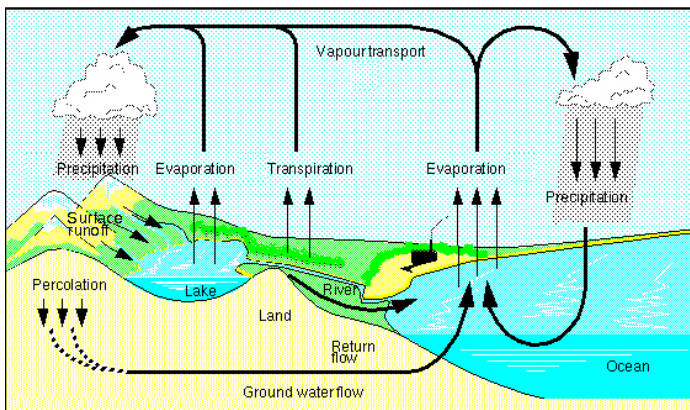


The Simple Solution to Solving Scale Problems

How it Works

The Problem

To understand how this patented technology effectively both prevents and removes hard water scaling, it is necessary to understand the basic reasons why we experience scaling problems. This starts with the water cycle illustrated below.



Although rain initially begins to fall as pure water (H_2O) it collects carbon dioxide (CO_2) in the atmosphere turning water acidic (carbonic acid H_2CO_3). As it permeates through the ground, the rainwater gathers even more CO_2 from decaying vegetation enabling it to dissolve minerals.

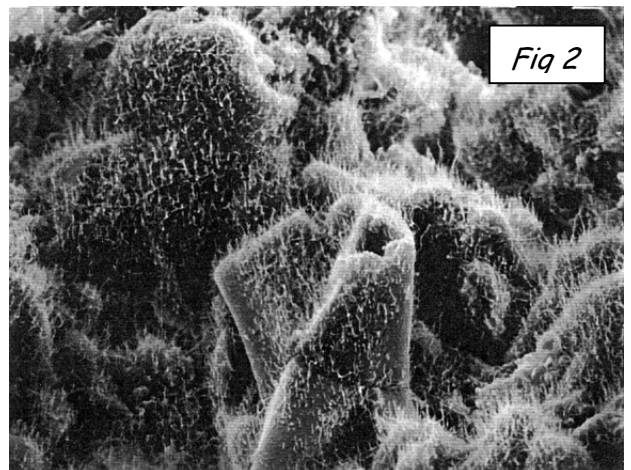
In hard water areas, the principal dissolved mineral is calcium carbonate, ($CaCO_3$) which comes from limestone or chalk. This freely dissolves in the acidic water because the normally insoluble calcium carbonate changes to a soluble bi-carbonate

($Ca(HCO_3)_2$). This together with other minerals and trace elements forms part of the chemistry of the water. Conventional filtration will not remove these ions. This is just as well because most of the minerals and trace elements contribute to our general health.

Water Companies extract this highly mineralised (hard) water from deep underground and treat it to ensure that it is safe to drink. The addition of chlorine guarantees that the water remains safe and free from harmful bacteria, right to the point of delivery.

When hard water is subjected to energy, either in the form of heat or pressure, carbon dioxide is driven out, resulting in calcium reverting to a carbonate. A small positively charged hard crystal forms, which immediately gets attracted to an opposite charge, usually something man-made such as pipe walls or heating surfaces. Further precipitated crystals then seed onto this surface and a hard scale continues to grow in an accelerated fashion.

A showerhead scales due to pressure drop, again causing precipitation of the calcium ion. Figure 2 shows this hard, *Velcro*-like crystal magnified 1500 times.



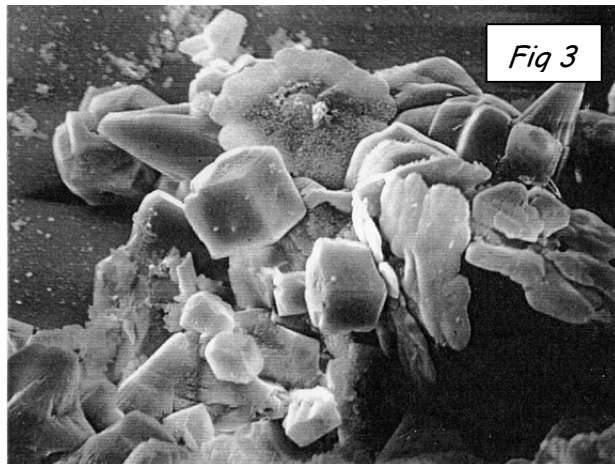
The Solution

The patented *Scalewatcher*TM *ENiGMA* generates a complex frequency modulated signal, which is applied by simply forming a coil around the outside of the pipe. The objective of applying these thousands of differing frequencies simultaneously, is to induce a voltage in the water, match the resonant frequency of the dissolved ions and thereby give them sufficient energy to release the carbon dioxide and break their bond with the water molecules.

The principle of resonance is well known and widely used by engineers. It uniquely results in more energy being created than is applied. A practical illustration can be demonstrated by an opera singer who, when maintaining the coincident pitch (frequency), creates sufficient energy to shatter a glass.

/This enforced

This enforced precipitation results in a crystal forming which seeds onto other ions in the water, (such as zinc, iron, etc). Figure 3 clearly shows the different crystal formation resulting from being prematurely precipitated by *Scalewatcher™ ENiGMA*. This simply gets carried through the water system and down the drain.

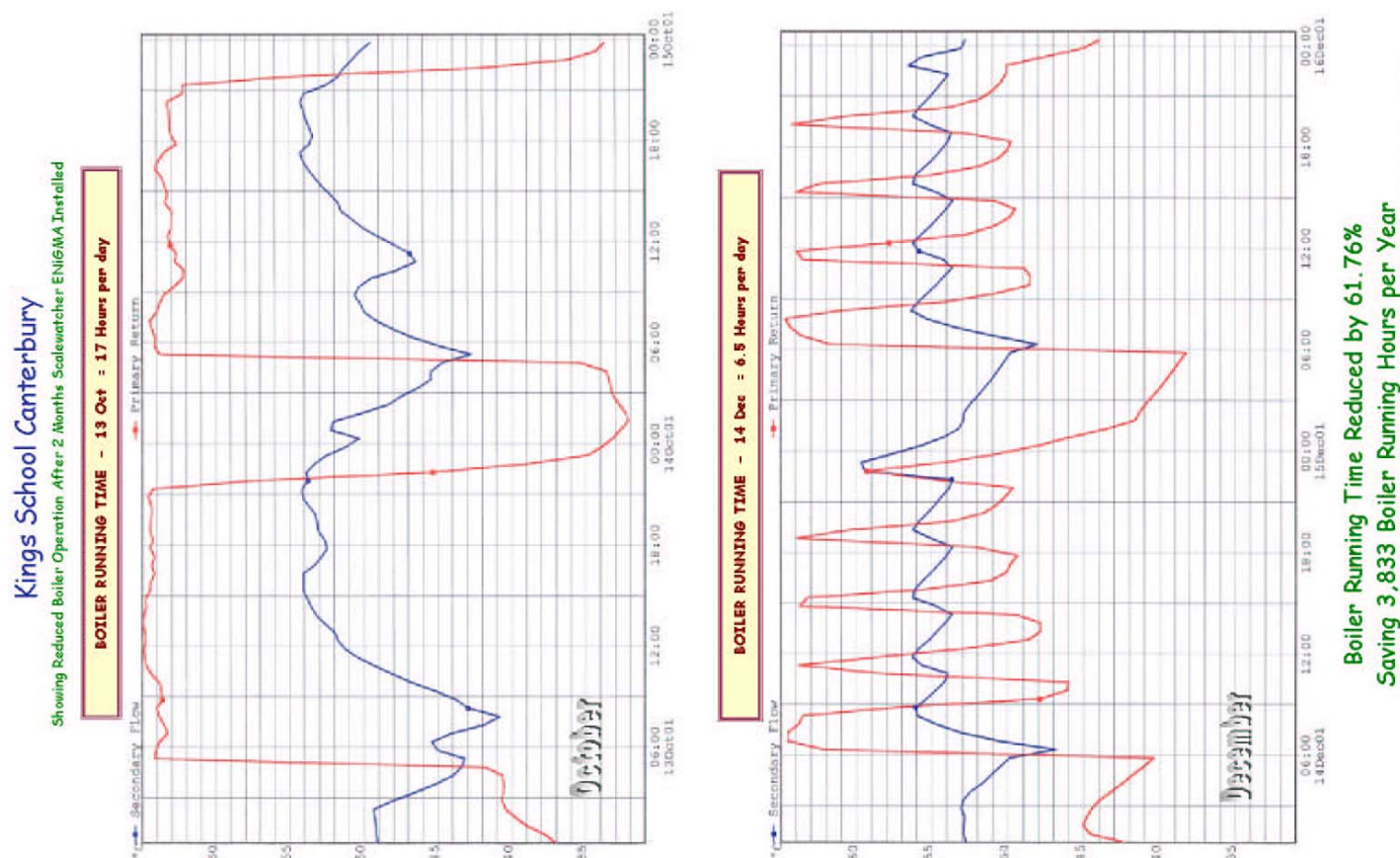


Discerning customers have demanded proof of the effectiveness of the technology since it first became available in 1989. This is very easily achieved as in addition to preventing scale it also removes existing deposits. Therefore, by either visually or by sensor devices, such as temperature data loggers, the affects of the technology are easily measured and recorded. Indeed some applications are actually self-measuring. For example, when installed on a swimming pool, within just three months the consumption rate of chlorine drops by up to 50%. This is due to the fact that by removing calcium deposits bacteria is dramatically reduced.

The Secret of Success

Other devices have not proven as effective as the *Scalewatcher™ ENiGMA* simply because of their inherent limitations. In a recent test undertaken by Cranfield University for a major Water Company, the unit proved to be 36% more effective at preventing scaling, than its closest rival.

But this is not the full story. Our unique experience in introducing and developing this technology has resulted in our application knowledge becoming the major factor in its effectiveness. We know what prevents optimal operation, what reverses the effects, what to apply and where it is most effective. It is our applications knowledge and experience that allows us to offer the most cost effective solution. We have also become expert in measuring performance (see example below). **That is why we are able to guarantee the results.**



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