



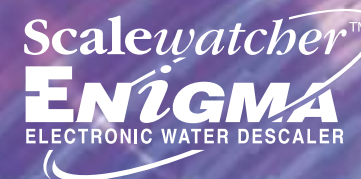
# EXCELLENT PERFORMANCE THROUGH EXPERIENCE

Since 1989 ETC has helped many institutional, commercial and industrial clients save many thousands of pounds. These include:

- Alsthom Gas Turbines Ltd
- Amec Construction Ltd
- Anglian Water
- AWE Aldermaston
- B & Q plc
- Bank of England
- Barnardo's Property Services
- Birds Eye Walls Ltd
- Biro BICC
- British Broadcasting Corporation
- British Sugar
- Britvic Soft Drinks
- Canary Wharf Management Ltd
- Corus UK Ltd
- Dairy Crest
- De La Rue Holographics
- Department of Environment
- Essex Police HQ
- Everest Frozen Foods
- Goodyear Tyres
- Guinness Brewing
- Guys Hospital Medical School
- H J Heinz Co
- Harefield Hospital
- Hewlett Packard

- Hilton Hotels
- HMS Nelson
- Hozelock Ltd
- HQ 145 (Home Counties) Brigade
- Hydro Aluminio Poralex
- ICI Agrochemicals
- Ipswich Hospital
- Jersey Electric Company
- John Lewis
- Johnson & Johnson
- Kings College Hospital
- King's School, Canterbury
- Legal & General Insurance
- London Borough of Southwark
- London Bus
- Lorne Stewart plc
- Manor Bakeries Ltd
- Marriott Hotels
- McCain Foods
- Metropolitan Police
- Mid Kent Water
- Nissan Cars (UK)
- Novotel Hotels
- Nuclear Electric
- Proctor & Gamble
- Queen Elizabeth Hospital, Barbados
- RAF Mildenhall
- RHP Bearings Ltd
- Ricoh (UK)
- RN Aircraft Yard Fleetlands

- Rothmans of Pall Mall
- Royal College of Physicians
- Schlumberger Industries
- Smith & Nephew Medical Fabrics Ltd
- SmithKline Beecham
- Southern Water
- St Pauls Cathedral
- St Thomas' Hospital
- Starbucks Coffee Company
- Sun Life of Canada
- Tate & Lyle Europe
- Thames Water
- The Belfry Golf & Country Club
- The Boots Company PLC
- The Brewery Research Foundation
- The National Trust
- Timken Desford Steel Ltd
- Unilever Ice Cream & Frozen Food Ltd
- University of Cambridge
- University of Oxford
- UPM Kymmene Shotton Paper Mill
- Wadworth Brewery
- Waitrose Ltd
- Wessex Water
- Whitbread plc
- Yorkshire Water Services Ltd
- Youngs Bluecrest Ltd
- Zeneca Agrochemicals



## EFFECTIVE PHYSICAL WATER TREATMENT



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Fareham, Hampshire PO17 5LJ, UK

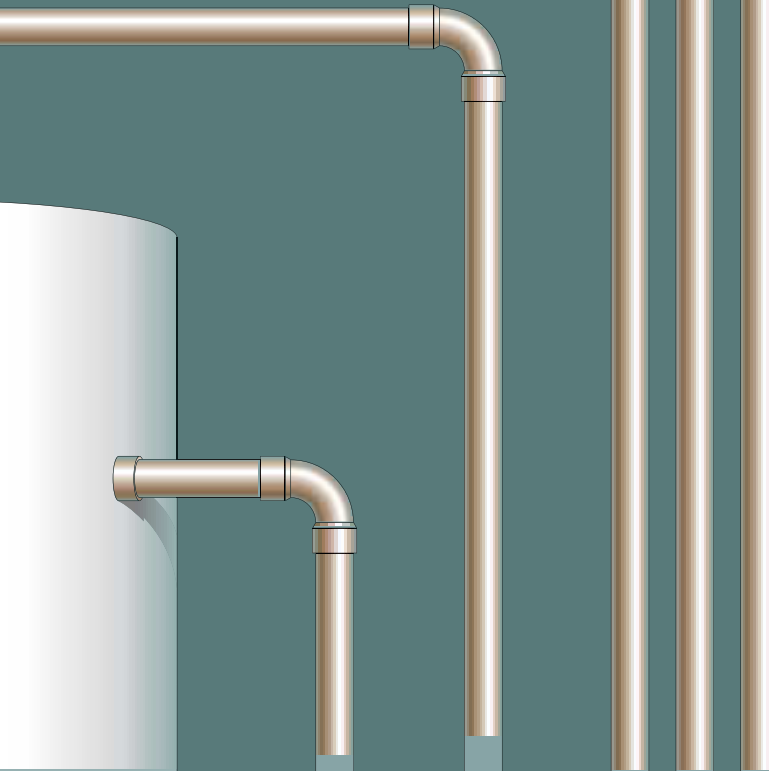
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Member

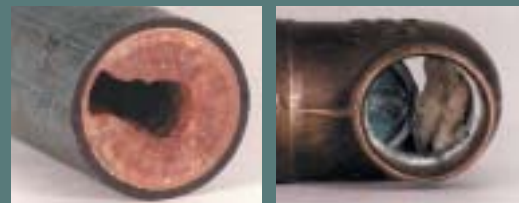


BRITISH WATER  
expertise worldwide

# THE PROBLEM OF LIMESCALE



“ 6 mm of limescale will reduce energy efficiency by a staggering 40%”



## Hard water

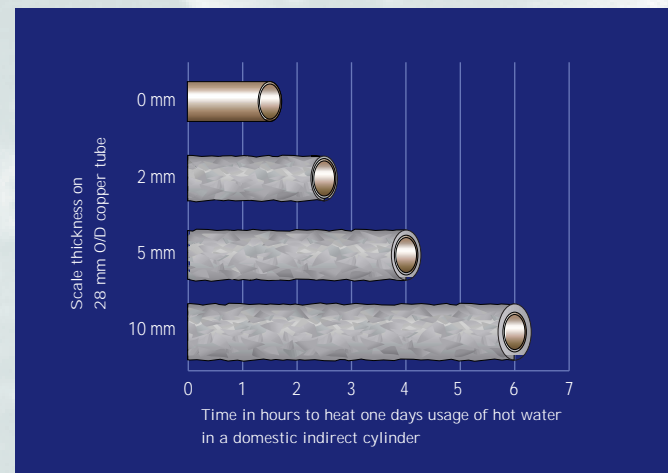
Water performs many vital functions, but not all its features are equally beneficial in all applications.

Water that is naturally hard, as in 70% of the UK and most other countries, contains dissolved calcium and other minerals. These help to build and maintain healthy bodies, but their effect on pipework and water systems can be disastrous.

When water-borne minerals, such as calcium bicarbonate, revert to their solid carbonate state, limescale is formed in water systems, and this narrows pipes, blocks jets, slows the flow, reduces thermal efficiency and provides a breeding ground for bacteria.

Research has shown that just 6 mm of limescale will reduce energy efficiency by a staggering 40%, and, in a moderately hard water area, 6 mm of limescale can form in pipework, or on heat exchangers in just 2 years.

This in turn results in higher running costs. Billions of pounds are wasted every year in increased energy bills, lost production and early renewal of capital equipment.



Increased boiler time, due to scale  
 With no scale on its heat exchanger, a domestic hot water cylinder takes 1½ hours to heat up. With just 5 mm of scale the boiler has to run for over 4 hours wasting over 2½ hours of fuel.  
 Source: University of Portsmouth

## Safety considerations

Bacteria, including Legionella Pneumophila, proliferate in water systems with even moderate amounts of scaling, particularly in systems where scale prevents water reaching sufficient temperature to act as a biocide.

Isolation valves are often impossible to close due to scaling.

Safety or pressure relief valves often stick due to scale.

## The chemical solution

The traditional solution to the problem of limescale has been the use of chemicals to prevent or remove scale, and to control the bacteria that thrive because of it. The use of chemicals, however, can cause or increase corrosion and create further environmental problems. It is also expensive. Descaling alone is estimated to cost industry in the United Kingdom around £1 billion a year.

## The alternative to chemicals

Over the years many methods of physical water treatment have been tried. For example, placing alternate magnetic poles in parallel to flowing water induces a voltage in the water. The frequency of the voltage is dependent on the velocity of the flow. If the frequency happens to be correct for the given conditions, precipitation occurs and the resultant crystals remain in suspension in the water.

The drawback with this method is that the frequency required varies according to the conditions in the water system, e.g. flow-rate, water quality, temperature, pH etc. Therefore the results will be inconsistent, and this is the reason why Physical Water Treatment failed to gain wide acceptance.

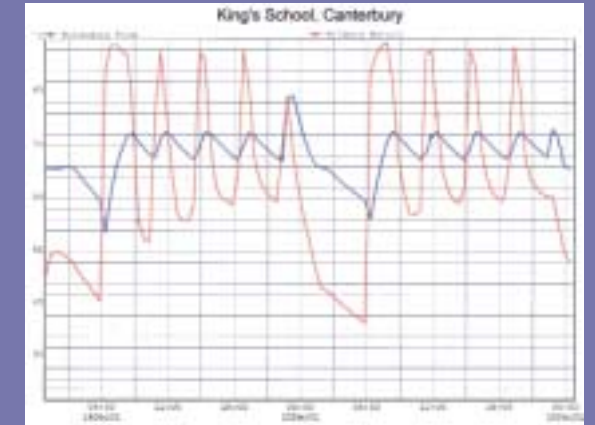
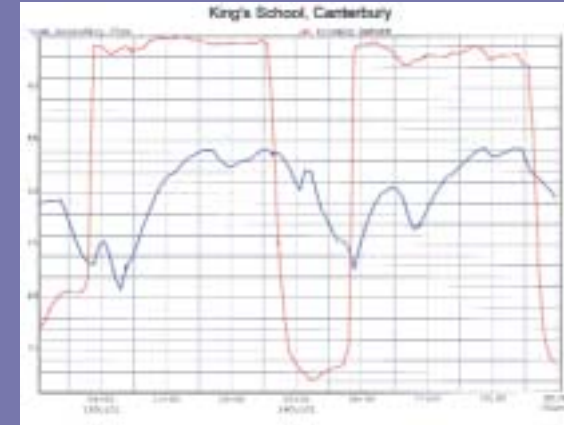
In 1989, however, a new form of Physical Water Treatment was patented that did not involve magnets, chemicals, acids and expensive softening equipment, but achieved predictable and consistent results – the Frequency Modulated (FM) Electronic Descaler.

# THE SCALEWATCHER ENIGMA SOLUTION



“ boiler running time reduced by 61.76%, saving 3833 boiler running hours/ year”

King's School, Canterbury



Scalewatcher Enigma installed at King's School, Canterbury showing reduced boiler operation after 2 months. Boiler running time reduced by 61.76%, saving 3833 boiler running hours/ year.

## Environmental Treatment Concepts

The Scalewatcher Enigma Electronic Descaler is produced by Environmental Treatment Concepts Ltd (ETC), a company that is in the forefront of the application of research into the ecological and economical treatment of hard water.

Many years of working with universities, water companies, industry and domestic users have given ETC unique specialist experience in using this technology to solve hard water problems.

ETC pioneered electronic water descaling in 1989. In 1990 ETC won the What's New in Industry Award for services to British Industry. The company believes in continuous investment in research and development; it does not merely sell equipment, it ensures that its customers receive a solution and the very best in technical support and advice.

ETC is an active Member of British Water. ETC was also a founder member of the UK Physical Water Conditioning Association (UKPWCA) which operated a strict code of conduct ensuring clients receive accurate advice and a high level of technical support.

## Introduction to Scalewatcher Enigma

Scalewatcher Enigma overcomes the shortcomings of other physical water treatment systems by electronically generating the full range of frequencies required, at just the right intensity, thus ensuring consistent results over the full range of applications. In the newly developed second generation units industrial microprocessors ensure reliable signal generation and control.

Independent university tests have confirmed Scalewatcher Enigma's ability to remove existing limescale and prevent formation of new deposits.

The Scalewatcher Enigma provides a simple and economical solution to the limescale problem. It has been successfully installed for customers from all sections of commerce, industry and Government.

Wherever hard water is used, the Scalewatcher Enigma helps to maintain maximum efficiency in water heating and cooling systems.

## Typical uses

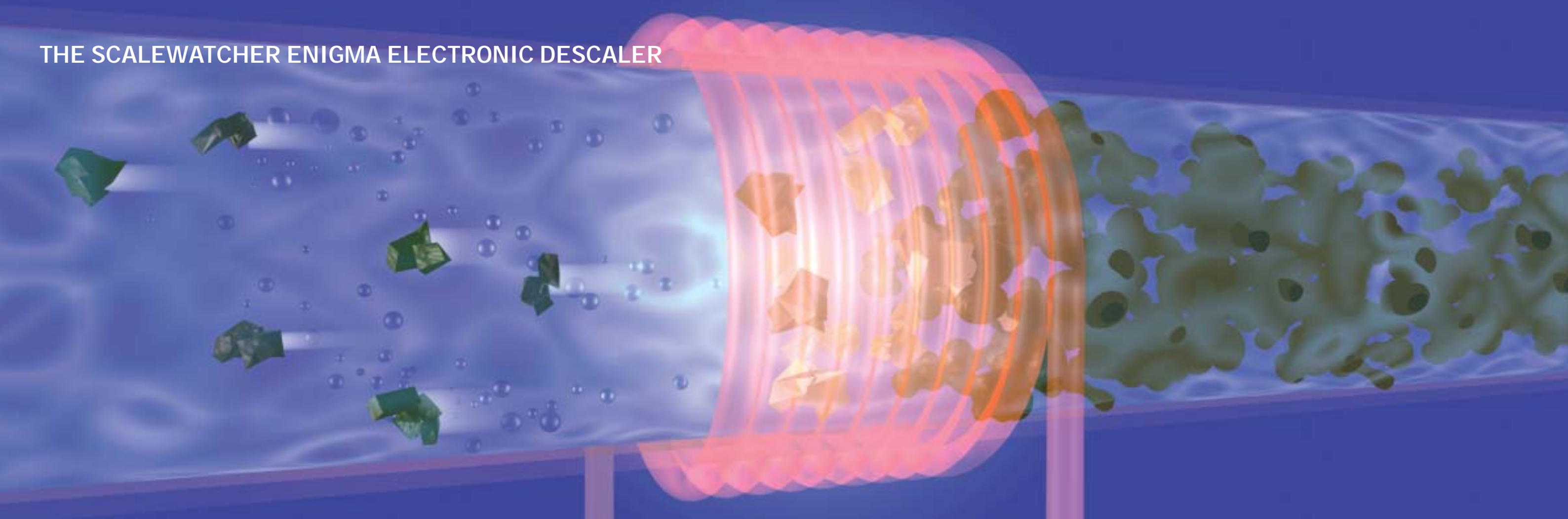
- Domestic hot water systems
- Cooling systems including cooling towers
- Refrigeration and chiller systems
- Humidification systems
- Swimming pools
- Effluent treatment including lime softening
- Milk and milk product processing

## Benefits of Scalewatcher Enigma

- Extends life of capital equipment, prevents limescale build-up, descales existing systems
- Achieves large energy savings
- Reduces maintenance costs
- Reduces downtime
- Short pay-back period
- Easy to install and move
- Can be installed over outside of lagging
- More than one pipe can be treated with just one unit
- Uses no chemicals – can be used for drinking water
- Reduces bacteria levels
- Can be used with any size of pipe, any material, any flow rate
- All Scalewatcher Enigma units carry 1 year manufacturer's guarantee, in addition to 12 month performance guarantee.



# THE SCALEWATCHER ENIGMA ELECTRONIC DESCALER



## Description of Scalewatcher Enigma

Scalewatcher Enigma is an electronic descaler that is applied externally to the pipework or water treatment installation.

A range of units are available to cover pipe sizes from 8 mm to 1250 mm. Treatment is applied simply by wrapping a signal cable around the outside of a pipe to form a coil.

No cutting into the pipework or additional plumbing is required.

## How Scalewatcher Enigma works

To understand how Scalewatcher Enigma works it is necessary to have a basic understanding of why scale forms in water systems in the first place.

Rain absorbs carbon dioxide as it falls to earth and percolates through the ground. The resulting acidity of the water causes normally insoluble carbonate limestone to dissolve into a bi-carbonate.

Thus calcium becomes part of the water chemistry, and cannot be removed by simple filtration.

When subsequently heated the hard water releases the carbon dioxide reverting the calcium back to its carbonate state by precipitating hard, ionically charged crystals which are immediately attracted to the closest surface exhibiting an opposite ionic charge, usually the pipe wall, heater element etc. Crystals thus form together to produce scale deposits.

Using modern microprocessors and signal processing techniques, the Scalewatcher Enigma produces a complex, modulating frequency waveform (which in terms of magnetic strength is insignificant). When this is applied to the water, the energy induced in the water is sufficient to cause the premature precipitation of the calcium. Because precipitation

occurs in the bulk of the water, the crystals seed onto other naturally occurring ions in the water, such as zinc, copper, iron etc. Their size and shape bear no physical resemblance to those formed in untreated water and they remain in suspension until discharged to drain.

This process naturally results in an increase in solubility, which allows the now unsaturated water to dissolve existing scale and remove it from the water system. Even deposits on the outside of the water system, on bathroom fittings for example, will soften with regular contact with the treated water and will soon be easy to wipe away without the use of chemicals.

The key to effectively making use of this process lies in understanding not only the process itself but what prevents it happening and what causes the water to revert back to its previous condition.

It is this understanding and many years practical experience that have enabled ETC to master fully this exciting new technology. ETC was the first company in the world to demonstrate publicly a change in treated hard water, whereby to date nobody else has managed to even measure a chemical change after treatment.



Calcium from untreated water



Calcium from treated water

Magnification x 1500  
(Courtesy of the University of Portsmouth)

# PROCEDURES

## Typical procedure

To obtain optimum effectiveness from Physical Water Conditioning (pwc) a number of factors need to be addressed. Simply putting a unit on the rising main may well give acceptable results in a small domestic dwelling application but is likely to lead to customer dissatisfaction for the larger systems.

As soon as the water is treated it begins to revert back to how it was. Treated and held in a cold storage tank the water will maintain sufficient treatment over 3-4 days to be effective in preventing hard scale formation. Heat the water and the reversion process will be accelerated. The other major cause of reversing treatment is turbulence.

This latter cause is not always easy to predict. Centrifugal pumps are an obvious source of turbulence, others, such as tortuous pipework runs are not so obvious. Spraying actions will also undo treatment, however as they are often either the last action before going to drain or the water is re-circulated (and hence can

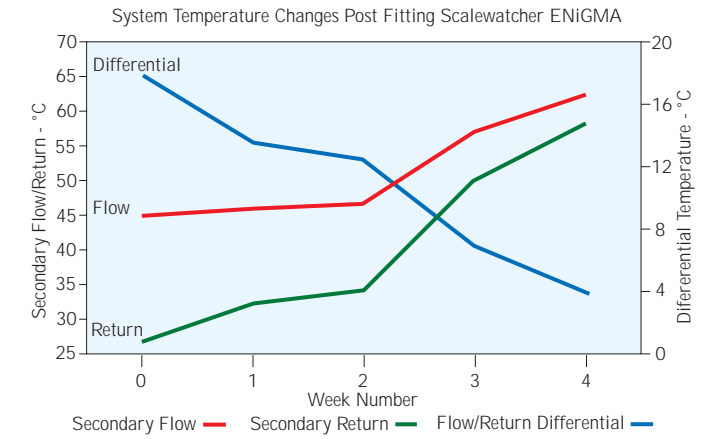
be retreated) this may not matter. The exception being the ball-cock valve, the usual route into a cold storage tank. Here both storage and turbulence combine to reduce pwc effectiveness.

The most effective siting of pwc treatment units is just prior to the problem areas. However a balance must be made against the cost of this approach. A skilled and experienced pwc Engineer will be able to weigh up the pros and cons of where best to site the units, to give a good level of treatment at the lowest cost.

Other important considerations will also need to be addressed, such as the effect of interference of the treatment field caused by other magnetic/electro-magnetic sources, the fluid velocity and the necessary time for the treatment to be fully set, before heating takes place. Just like the use of chemical treatment, which itself is ineffective if not applied correctly, the purchaser is paying for the applications knowledge and ability of the company and person applying treatment and not what is in the bottle.

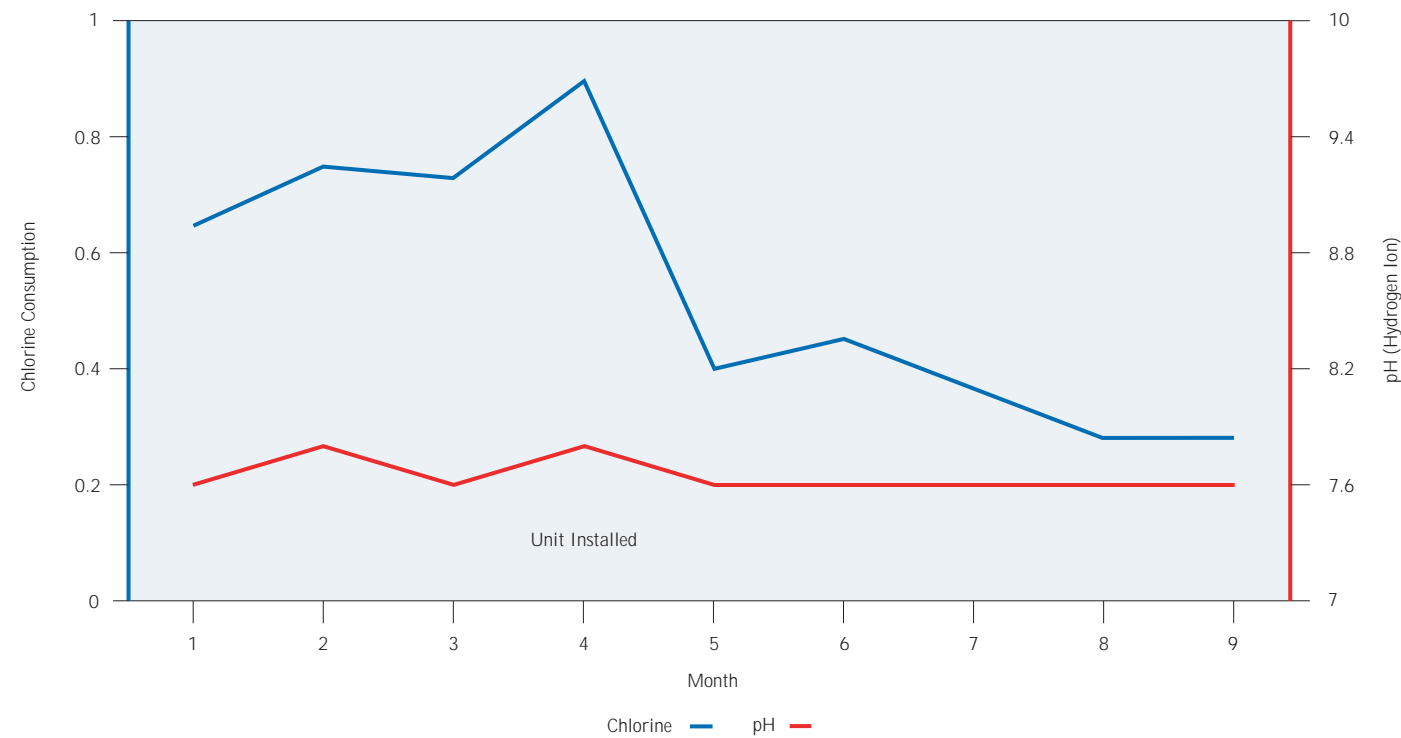
To achieve optimum results it is necessary for the pwc application engineer to go through the physical and operational make-up of the system, with either the system engineer or the designer. The objective is to identify problem areas and their causes, determine such variables as how often certain repairing actions need to be undertaken and most importantly how the client can establish the baseline and then measure the effectiveness against it.

This latter objective is most important as it is essential the client is able to determine the effectiveness of the treatment. It can either be something very simple, although very disrupting such as opening up the system and carrying out a visual inspection, to something more complex but easier to implement like fitting data logging equipment.

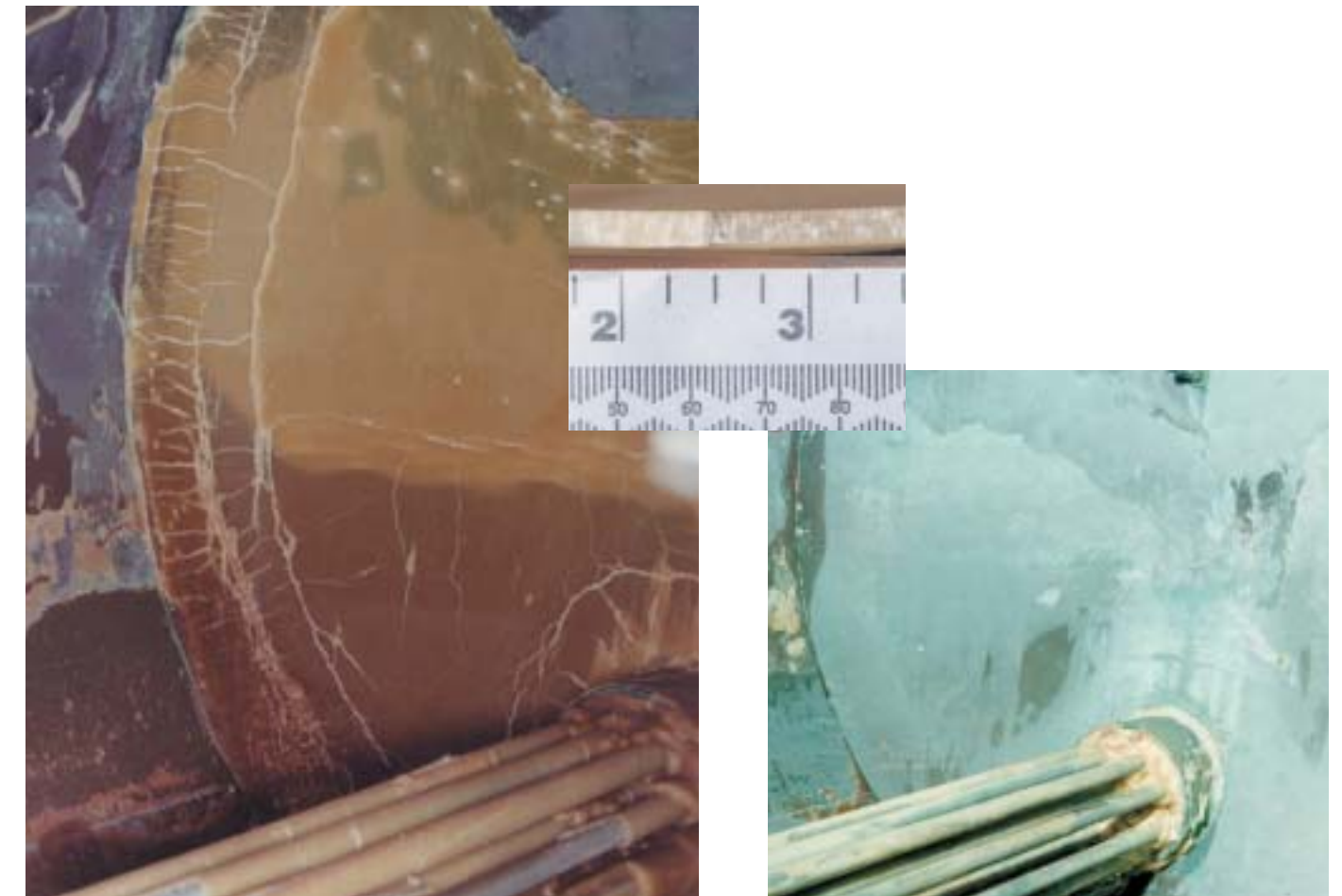


Data logger analysis showing Scalewatcher Enigma descaling a water system

Warlingham County Secondary School Swimming Pool Post Fitting Olympic



**Swimming Pool Application** The perfect application to demonstrate the effectiveness of this technology to control calcium. The reason for these very significant changes is simply that the calcium scale deposits within the pool environment are dissolved back into the water resulting in a dramatic reduction in bacteria levels. This leads to a reduction in chlorine consumption of between 30 to 50% and a pool that is literally easier on the eye.



RAF Odiham Sergeant's mess calorifier (above), showing results after 6 months (right)

# APPLICATIONS OF SCALEWATCHER ENIGMA

Scalewatcher Enigma units are used in a wide range of commercial and industrial applications, including the protection of Water Companies' water treatment plant.

These applications have included every conceivable method of heating, cooling or spraying water, at temperatures ranging from just above freezing to the heat of exhaust gases from an aircraft jet engine running in a test rig.

End users have included household names in plastics, rubber and metal manufacture, electricity companies, leisure centres, nursing and care homes, hospitals, food and drink manufacturers, ships, paper and pulp manufacturers, restaurants, mining companies and farms.

## New installations

Installed at the outset, Scalewatcher Enigma will extend the efficient working life of water systems and associated equipment, reducing maintenance and running costs to the benefit of the building owner, and of the environment by keeping the emission of greenhouse gases to a minimum.

## Existing installations

Applied to systems that have become inefficient and costly because of the build-up of limescale, Scalewatcher Enigma removes the need for chemical descalants and the early replacement of pipework, water-fed equipment and appliances.

By dissolving the scale, Scalewatcher Enigma will restore the system back to its design performance, thereby delivering energy savings and reductions in greenhouse gases. Experience has demonstrated that scale is removed in a fraction of the time it has taken to form. The resulting pay-back period can be as little as a few months, and has rarely been longer than two years.

## Customised applications

The Scalewatcher Enigma can be tailored to a customer's individual needs. Most installations follow a detailed survey of the problem, a discussion to agree the criteria for success, and agreement on how performance is to be monitored and measured.

If it is a completely new application, for example on a non-water application, a Rental Evaluation is proposed to allow both parties to establish the efficacy of the installation, before capital expenditure is incurred.

By this method a number of new applications have been developed, such as the treatment of other fluids, including ferric aluminium sulphate, zinc phosphate, sea water and milk.

The effectiveness of other processes, such as effluent solids/water separation using polymers for flocculation are improved by pre treating using Scalewatcher Enigma conditioning.



St Paul's Cathedral 1675 Architect: Sir Christopher Wren;  
Water treatment: Scalewatcher Enigma



30 St. Mary Axe (Swiss Re building) 2004 Architect: Sir Norman Foster;  
Water treatment: Scalewatcher Enigma



## Technical services

ETC does not merely sell equipment. Each application is assessed in detail, and a solution proposed that meets the customer's specific requirements. Both during and after installation of Scalewatcher Enigma, ETC ensures that its customers receive the very best in technical support and advice.

## Customised applications

The Scalewatcher Enigma Electronic Descaler is tailored to each customer's individual requirements.

For further information on the technical support and customised applications offered, contact ETC on:

T +44 (0) 1329 836960  
F +44 (0) 1329 835406

## Performance guarantee

For standard applications and provided that a criteria for success agreement is made at the time of installation, ETC is willing to guarantee the performance of Scalewatcher Enigma for a period of one year from date of purchase.

This is additional to the manufacturer's guarantee.

Scalewatcher Enigma does not affect potability or the natural mineral content of the water as there is no direct contact with the water. Therefore the manufacturer accepts no responsibility for water quality.

### Project SLAM

*Prevention is better than cure*

ETC is playing a valuable role in the first five-year phase of Defence Estates' £multi million SLAM project to upgrade Single Living Accommodation for some 10,000 members of the armed forces. This is one of a series of such projects for which the government allocated £1 billion of new money in March 2001.

The specified choice for water treatment, Scalewatcher Enigma is expected to save £millions of public money over the anticipated 60-year design life of the new buildings. Occupants will be saved the considerable inconvenience and discomfort that might otherwise result from breakdowns over that time.

Importantly, the installation will enable Debut Services Ltd, who are constructing and maintaining the SLAM buildings over a seven year period, to meet a contractual requirement to hand over the buildings in as new condition.

