

The Problem Identified

Limescale on the surfaces of pipes, heat exchangers and other water system components have significant implications for energy efficiency, system performance and plant integrity.

Limescale in hard water areas has been a problem since people first started heating water and now makes a major contribution to the running costs of heating and hot water systems used in both building services and industrial applications. In the UK alone the cost of limescale formation to industry is estimated at over £1bn per annum and the cost to the environment through wasting energy is equally significant.

Studies have shown that a 25mm thick layer of limescale on a heat exchange surface will reduce heat transfer by 95% and this has implications for energy costs. Just a 1mm layer of limescale will increase energy costs by 7.5%, while a 12mm layer will raise this increase to 70%.



Limescale has the potential to impair performance at many points in a water system:

- Inefficient heat transfer on heat exchange surfaces
- Blocked pipes leading to early replacement
- Seized valves
- Blocked showerheads
- Unightly deposits

The Kal-GUARD+ Process

It has been known for many years that the addition of zinc to hard water, even in minute quantities, will effectively inhibit limescale formation. And the higher level of zinc ions in the water, the greater the effect on scale formation - to the extent of removing existing scale deposits.

Kal-Guard+ exploits this phenomenon by using a zinc anode and copper cathode to create electrolytic action that releases minute quantities of zinc into the water - at levels well within the water regulations. The unit's electronic controls are set to the hardness of the water, so the levels of zinc released are fine tuned to provide optimum performance.

These zinc ions in the water cause the mineral salts in the water to clump together and remain in suspension, rather than settling onto the surfaces of the system. The zinc also influences the way the calcium carbonate in the water crystallises, encouraging the formation of soft aragonite crystals rather than the harder calcite crystals associated with stubborn

limescale. The result is that as calcium crystals are flushed through the system with the water, any that are left on surfaces can be wiped off with a damp cloth.

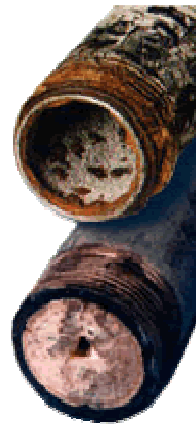
Kal-GUARD+



Features & Benefits

Kal-Guard+ provides an environmentally-friendly solution to limescale that saves money through greater energy efficiency, reduced maintenance and enhanced performance of water systems. Cost savings are achieved in the following ways:

- Maintains heat transfer efficiency by preventing scale build-up.
- Improves water flows by preventing pipes from scaling up.
- Reduces downtime of plant for de-scaling.
- Increases service life of plant.
- Minimises the need for chemical de-scaling treatment.



Frequently Asked Questions

Q. Has Kal-Guard+ been thoroughly tested?

A. Yes, the electrolytic action of Kal-Guard+, using a zinc anode, has been tried and tested over many years in a wide range of applications. Building on the success of the original Kal-Guard, Kal-Guard+ incorporates electronic controls to synchronise the release of zinc to the hardness of the water. Tests at Cranfield University have confirmed that Kal-Guard+ reduces limescale formation by up to 80% compared to non-treated water and these results have been borne out in extensive field trials.

Q. Is it safe to put zinc into the water?

A. Zinc is a naturally occurring mineral which forms an essential part of the human diet. It is found in high levels in grains and pulses and is one of the reasons these foods are

considered beneficial to health. The levels of zinc released by Kal-Guard+ are relatively low, even at maximum dosage, and will not affect the taste of the water.

Q. Will Kal-Guard+ remove existing scale deposits?

A. Tests at Cranfield University showed that Kal-Guard+ will remove existing scale deposits as well as preventing the formation of further limescale. However, if your system is badly scaled we would recommend thorough descaling prior to fitting the Kal-Guard+ in order to achieve the full performance benefits in the minimum time.

Q. Does Kal-Guard+ soften the water?

A. No, Kal-Guard+ is not a water softener. Water softeners remove calcium salts from the water, Kal-Guard+ does not remove these salts but ensures they do not settle onto surfaces as limescale.

Q. Is Kal-Guard+ easy to fit?

A. Kal-Guard+ is very easy to fit, as it is plumbed in line to the system. Even when retrofitting to an existing system, only two simple cuts to the pipework are required.

Q. What are the maintenance requirements for Kal-Guard+?

A. Kal-Guard+ only requires occasional visual inspection of the control display to confirm the unit is functioning properly

Independent Testing

Testing of Kal-Guard+ was carried out by The School of Water Sciences, Cranfield University. All scale samples were dissolved in 0.1% HCl. In some cases, more concentrated acid had to be added during the dissolving process. Calcium content in the dissolved scale samples was then analysed using an AtomsScan 16 Sequential ICP Spectrometer and the amount of scale formed then calculated. Results are shown as scaling rates.

A rapid scaling test was used to compare the scaling potential of water samples with and without treatment. The rig consists of 1 litre plastic tank, a heating element covered by removable sleeve and is temperature controlled. The water sample was heated to 70°C for 45 minutes. Then it was discharged and replaced by a new sample in which the heater was allowed to cool down for 15 minutes and then reheated. The test solution was magnetically stirred during the whole experiment. After ten repeats the sleeve was removed from the heater and the scale dissolved in 0.1% HCl, analysed on ICP-AES and scaling rates were

then calculated.

In these experiments scale formed on the heater sleeve and that formed in the bulk solution and on the walls of the tank was collected and measured. In the tests undertaken it was found that the water treated Kal-Guard+ unit reduced the amount of scale on the heater sheath by 80% when compared to the control. The Kal-Guard+ also reduced the level of scale formed in the bulk and when comparing the total amount of scale formed (combined heater + bulk) the Kal-Guard+ reduced scale formation by 74%.

Analysis of the scale samples collected after the tests showed that the scale produced after treatment with the Kal-Guard+ had more zinc in it than the control. Here it was found that 3.2 mg Zn mg CaCO₃ in the heater scale and 5.8 mg Zn mg CaCO₃ in the bulk scale.

