



electronic lime scale prevention systems



# Ioncal Electronic Lime Scale Prevention Systems

The technological, environmental and economic solution for lime scale incrustation

## Introduction: the formation of lime scale incrustation

Ideal water does not exist in nature, the water we have available should be considered as good or bad depending on the use of the same. The main problems that this can cause are mainly incrustation or corrosion. Incrustation is basically essentially made up of Calcium and Manganese and is due to multiple causes.

All natural water contains dissolved salts. Amongst the most usual we can find Bicarbonates, Chloride, Sulphates and Calcium and Magnesium Nitrates. When the Bicarbonate heats up in the water it makes Carbonates, which are relatively insoluble and precipitate in a crystalline form on the conduit walls, producing the so-called incrustation. These usually build up on the hottest surfaces, on the slow flow areas and on some accessories (valves, holes, etc.).

The most important consequences of incrustation are, on the one hand, those affecting electric heating elements, which can melt when the thickness of the incrustation is significant. On the other hand, sedimentation in the piping systems can very significantly reduce their diameter and in some cases cause the interruption of the flow. Additionally, mineral sediments are excellent thermal insulators, greatly reducing efficiency in the heat exchange process, with the subsequent increase in energy costs.



Seawater



Loss of diameter due to an accumulation of lime

Lime incrustation on an electric element



## Effects of incrustation

The negative consequences of incrustation are the following:

### HYDRAULIC

The accumulation of incrustation on equipment causes considerable decrease in the diameter. This will cause a considerable increase in energy due to the resistance generated by the passing of water through the same.

### BACTERIOLOGICAL

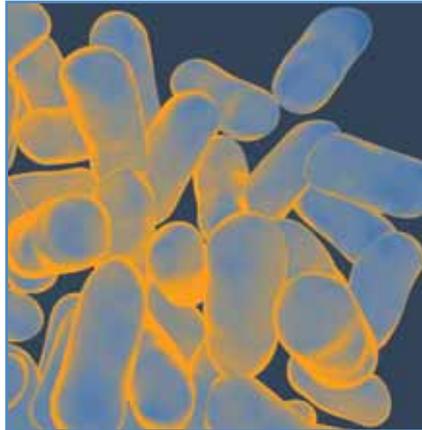
It has been proven that the lime scale incrustations in tanks, fountains, supply networks, etc. are an important factor causing the appearance of important problems such as the Legionnaire's disease.

### TECHNOLOGICAL

Due to the incrustation, the performance of the equipment will be reduced, as well as the useful life of the same.



Precipitación calcárea



Cultivo de bacterias



Instalación industrial

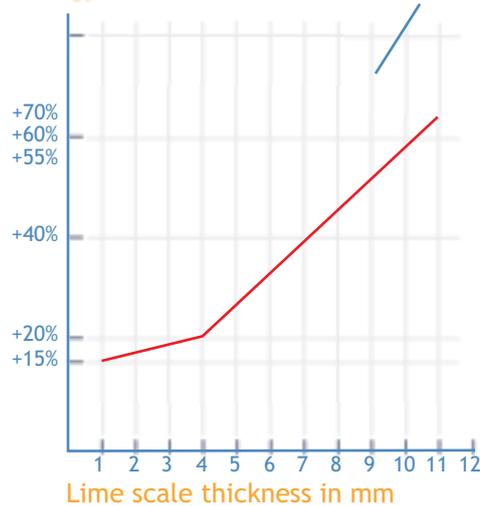
### ENERGY AND TECHNICAL

Incrustation prevents an optimum heat transfer, thus energy consumption will be higher to obtain the same performance.



Instalación industrial

+ 60 % Energy increase



The thickness of the lime scale incrustation causes considerable energy loss, as they act as heat insulators

Hardness interpretation:

| mg/l      | Description         |
|-----------|---------------------|
| 0 - 75    | Soft water          |
| 75 - 150  | Not very hard water |
| 150 - 300 | Hard water          |
| 300       | Very hard water     |

## Possible solutions to the incrustation problem

Various methods can be used in order to decrease or eradicate the formation of incrustation. The most usual are based on carrying out network water pre-treatment in order to eliminate the ions contained by filtering, ionic exchange and reverse osmosis, electro-dialysis, steam recompression, etc.



Reverse osmosis



Ionic exchange



Filters

Chemical products can also be added to the water, whose objective is to combine with some of the cations, (the divalent ones), and thus avoid the precipitation of insoluble inorganic salts.



Chemical products

### Differences between ioncal and other systems

|                                       | ioncal | descalcificador | productos químicos |
|---------------------------------------|--------|-----------------|--------------------|
| Maintenance                           | NO     | YES             | YES                |
| Consumables (salt, water, etc.)       | NO     | YES             | YES                |
| Consumable transport costs            | NO     | YES             | YES                |
| Pollution                             | NO     | YES             | YES                |
| Possible damage in the installation   | NO     | NO              | YES                |
| Neutralisation after the treatment    | NO     | NO              | YES                |
| Personal protection for the treatment | NO     | NO              | YES                |

## Electronic lime scale prevention treatment

Currently some treatments are being used consisting of the application of electronic signals of adjustable intensities in the installations where the lime scale incrustation is normally produced. The great advantage of its use is the fact that no foreign bodies are placed in the water, neither are any transformations produced in the substances dissolved in the same.



Las ondas constituyen un tratamiento eficaz contra las incrustaciones de cal

Its effect consists of the fact that an electric field causes an orientation of the ions included in the water, in such a way that the union of ions with an opposite charge for its orientation is made more difficult, so there may be two cases: the first is that there is no noticeable precipitation and the second, if precipitation does take place, for this not to be the usual crystalline type and therefore, the precipitation is not really a solid, hard lime scale incrustation, but a fine spongy and weak material that can be eliminated with periodical purges.



Precipitation of calcium carbonate



Remains of lime incrustation in a pipe not treated with ioncal



Water flow obstructed by the lime

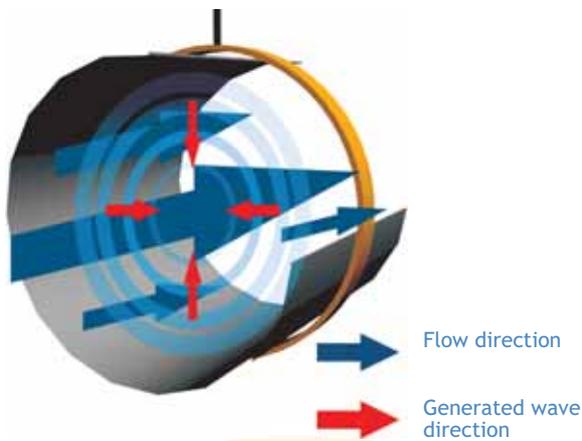
# Ioncal, the definite lime scale prevention solution

## Technology

IONCAL anti-lime equipment is an electronic system made up by integrated circuits that, by means of high pulsed magnetic resonance, generate variable frequencies signals with an electric potential, adapted to the dimensions of the pipe and flow to be treated.



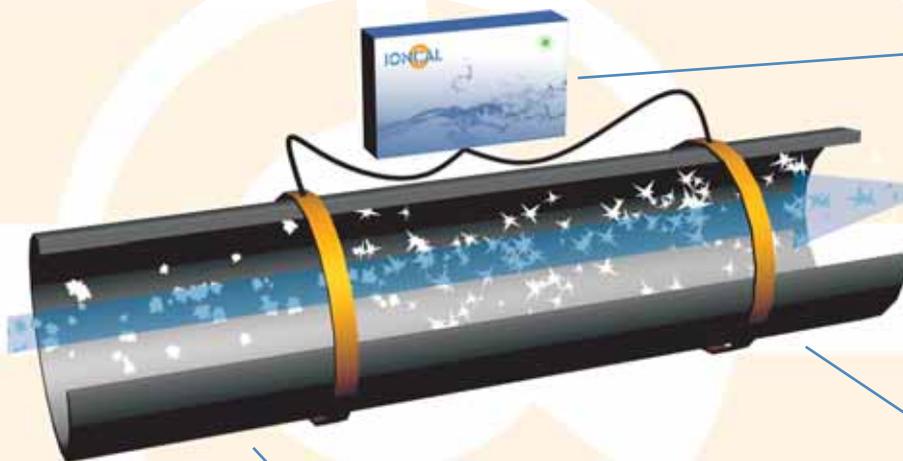
Electronic circuit



The IONCAL intervention consists of a series of electronic impulses aimed at the centre of the water in the pipes and that operates by means of an energy capacitive transfer, excluding, therefore, any electrolysis phenomena.

This energy is transferred to the water, by means of the pipe that acts as a condenser. It does not require any noxious substance in order to obtain excellent results and, due to its simplicity contributes to the conservation of the environment.

IONCAL is an electronic generator producing signals of a similar frequency to those of the magnetic resonance of calcium: the impulses act by significantly causing carbonate crystallization in a non-incrustation shape.



The particles change their shape from the point where IONCAL is installed.



Incrustation shape



Non-incrustation shape

The water treated with IONCAL preserves all its original chemical characteristics, thus not affecting its potability in any way whatsoever.



Flujo de agua

The calcium is not eliminated from the water but it remains in suspension in the same. The calcium crystals are removed by the water flow itself in the open circuits and by means of purges in the re-circulation systems.

Our laboratories have established that the acicular formation is conditioned to the electric balance in the water environment in which calcium carbonate crystals ( $\text{CaCO}_3$ ) are developed. This balance is perturbed by the zeta potential of the calcium carbonate colloids.

Supplementary research has been able to measure and quantify this imbalance in view of the accessible parameters causing the necessary electric charge for the re-balancing of the environment.

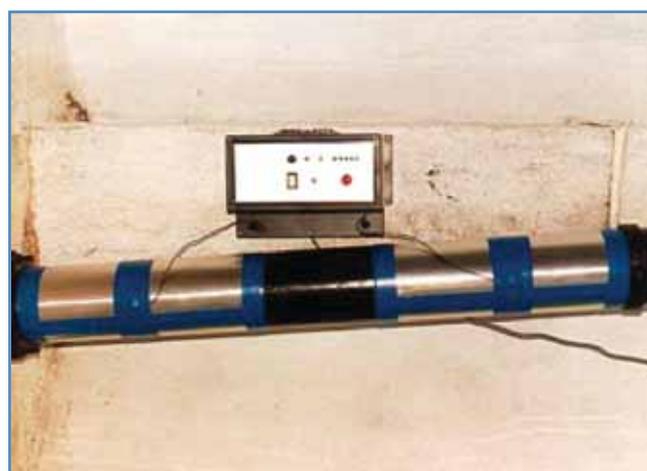
By means of a capacitive transfer, the IONCAL systems ensure, in this way and thanks to the setting up of a complex signal type, a perfect electric balance in the water environment modifying and transforming the calcium carbonate crystals into an acicular shape (therefore non incrustation).



Matraces de laboratorio

## Advantages of the Ioncal equipment

The technology applied by IONCAL has existed for more than 15 years in the market using metal plates protected by a dielectric “signal plate” around the tubes. Thanks to IONCAL, this technology has evolved using the most modern technological advances in the field of electronics.



The old models used large dielectrics



Equipo de ioncal en funcionamiento

We create the resonance effect inside the equipment and transfer the signal to the pipe in a simple but very effective way by means of two terminals that are joined to the pipe with two clamps allowing us work under adverse humidity conditions.

In our R&D department we have developed and made improvements in order to obtain a greater control of the emissions and the power of the waves. Thanks to these improvements we have been able to multiply the power of our equipment by 3 to 4 times, suppress the metal plates around the pipes, thus avoiding one of the weakest points in the old equipment; (malfunctioning due to short circuits to the pipe, humidity problems, water, etc.).



Técnico en nuestros laboratorios

The advantages of IONCAL equipment, compared with the other traditional water treatment methods already mentioned are the following:



- They are easy to install.
- They need no maintenance.
- Minimum electric consumption.
- Environmentally friendly, as they do not require the addition of chemical products.
- The system is ideal for treating water in individual houses, buildings, factories or whole municipalities.

## Ioncal range of equipment

We have available a wide range of equipment to cover a wide range of the market needs. We also have the possibility of manufacturing equipment for specific installations.

| Model | Pipe   | Dimensions | Voltage          |
|-------|--------|------------|------------------|
| E 30  | 1/2"   | 100x54x30  | 220/230v 50/60Hz |
| E 35  | 3/4"   | 100x54x30  | 220/230v 50/60Hz |
| E 50  | 1"     | 150x80x45  | 220/230v 50/60Hz |
| E 63  | 1 1/2" | 175x146x85 | 220/230v 50/60Hz |
| E 75  | 2"     | 175x146x85 | 220/230v 50/60Hz |
| E 80  | 3"     | 175x146x85 | 220/230v 50/60Hz |
| E 100 | 4"     | 226x146x85 | 220/230v 50/60Hz |
| E 125 | 5"     | 226x146x85 | 220/230v 50/60Hz |
| E 150 | 6"     | 226x146x85 | 220/230v 50/60Hz |
| E 175 | 7"     | 226x146x85 | 220/230v 50/60Hz |
| E 200 | 8"     | 323x146x85 | 220/230v 50/60Hz |
| E 225 | 9"     | 323x146x85 | 220/230v 50/60Hz |
| E 250 | 10"    | 323x146x85 | 220/230v 50/60Hz |
| E 300 | 12"    | 323x146x85 | 220/230v 50/60Hz |
| E 350 | 14"    | 323x146x85 | 220/230v 50/60Hz |



Low range power: Model E-30



Medium range power: Model E-75



High range power: Model E-350

We have equipment suitable for any type of installation:



Detached houses



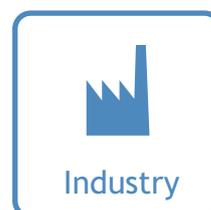
Residential



Buildings



Hotels



Industry



Municipalities





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