



## **Calcium Scale Basics**

### **How does the calcium get into the water?**

Much of our drinking water comes from ground water which originates from precipitation that falls in the form of rain or snow and seeps into the ground, filling the open spaces, or pore space, within layers of sand or gravel (formations) beneath the land surface. As the rain or snow passes through the atmosphere, it becomes enriched with carbon dioxide ( $\text{CO}_2$ ) and combines with the  $\text{H}_2\text{O}$  (water) to form a solvent of calcium known as carbonic acid ( $\text{H}_2\text{CO}_3$ ). As the rain seeps into the ground, the carbonic acid extracts calcium from the calcium rich stone and forms hydrogen carbonate [ $\text{Ca}(\text{HCO}_3)_2$ ]. When the extraction process ends, the water is saturated with calcium and the carbonic acid forming a carbonic acid/ calcium equilibrium. Depending on the ground quality, the amount of calcium and amount of carbonic acid determines whether more or less calcium is extracted into the water.

### **How does calcium scale develop on pipes and hardware?**

Calcium Scale is a hard thick coating or covering of calcium carbonate ( $\text{CaCO}_3$ ) that forms on heating elements and on the pipes and hardware of plumbing systems. As the calcium rich water enters into the home, the carbonic acid/ calcium equilibrium becomes interrupted within the pipes. Because the hydrogen carbonate ( $\text{Ca}(\text{HCO}_3)_2$ ) is a very weak chemical compound, temperature increases or movement cause the compound to breakdown and parts of the calcium ( $\text{Ca}^2$ ), magnesium ( $\text{Mg}^2$ ) and bicarbonate ( $\text{HCO}_3$ ) are no longer dissolved and attach to the surfaces of pipes, heaters, and hardware. Over time, the scale compounds and is very difficult and costly to remove.

### **What are the effects of calcium?**

#### **Negative Effect**

The negative effect of calcium is that it creates scale on pipes, hardware, and surfaces. This leads to high energy costs for heaters and expensive repairs for ice machines, coffee machines, and other appliances. The scale also may breed bacteria.

#### **Positive Effect**

Calcium enriched water is a health benefit and an important nutrient needed to help prevent or minimize diseases such as heart disease. Ideally, consumable water should contain adequate amounts of calcium and magnesium which are both found in hard water.



## **What calcium treatments are available?**

### **Water Softeners**

The “classical” water-softening unit operates on the basis of ion exchange; exchanging calcium and magnesium ions in water with an equivalent amount of sodium (Salt). Even though this is an effective and most common approach to dealing with scale, there are drawbacks. When a water softener is used, the result is not only soft water, but also increased sodium content in the water supply. Also, when the ion exchanger becomes depleted, it must be regenerated using a saline solution. This means a never-ending additional expense of salt is incurred for each and every regeneration cycle.

### **Magnetic and Electric Systems**

Magnetic and electric systems are a relatively new invention. The concept is that as water passes through a magnetic field, the calcium and magnesium ions are altered in such a way that they lose their ability to cause scale. However, these systems only have a limited effectiveness at best and this not a high enough percentage to prevent scale altogether.

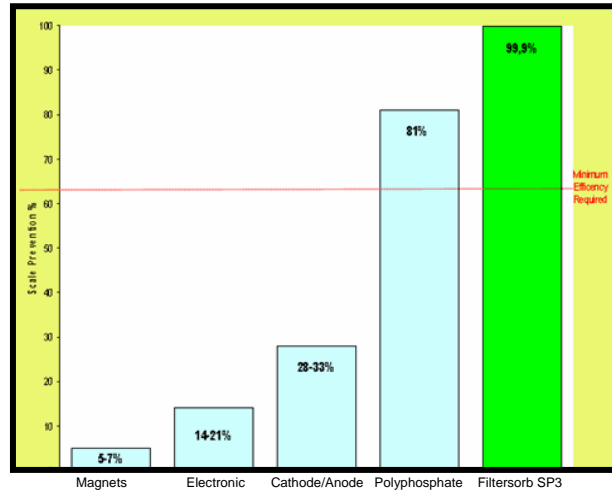
### **Polyphosphate**

The polyphosphate dissolves into the water and coats the iron, calcium and magnesium in it, making it difficult for these agents to precipitate out of the water and create the problems associated with hard water. Unfortunately, polyphosphate-type systems are only effective in cold water, low volume applications. Additionally, phosphates are considered a preferred food for bacteria and may cause other environmental problems.

### **Filtersorb SP3 Media**

The technologically advanced Filtersorb SP3 Media is an innovative solution that prevents all of the negative effects of calcium and magnesium, while allowing the positive health benefits to remain. The system is maintenance free, chemical free, salt free and does not require costly regeneration and backwashing.

## Calcium Treatment Comparison

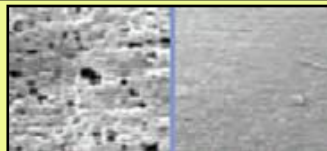


## Filtersorb SP3 Chemical Free Water Treatment Technology

### How does the CWG Filtersorb SP media prevent scale?

The Filtersorb SP3 media prevents the formation of scale that forms on heating elements and on the pipes and hardware of plumbing systems. The media does this by accelerating the transformation of the calcium and magnesium minerals into harmless “Nano” particles. When the inlet water goes into the water conditioner tank, the up flow pulls the water through the fluidized Filtersorb SP3 media which then acts as a catalyst and pulls the hardness minerals of calcium and magnesium out of the solution and then transforms these minerals into inactive Nano crystal particles. Because the hardness minerals have been transformed into Nano particles, these Nanoscopic particles make their way through plumbing systems without attaching on to pipes, fixtures, valves, or heating elements. Several years of testing has showed that the calcium and magnesium bonds cannot attach to any kind of surface resulting in 99% scale prevention.

Picture 1: (Left) a new pipe before the use with water. It is visible that even unused pipes have a rough surface.



Picture 2: (Right) after the use with Filtersorb SP3 for 6 months, a 30 micron 'ceramic' layer protects the pipe from corrosion.

### How does the CWG Filtersorb SP process work?

The Filtersorb SP3 anti-scale media is specially designed and manufactured to prevent harmful scale build up. Our anti-scale media is unique because the surface of the media is specially manufactured to be hard and similar to a ball bearing which protects the media from shearing off and results in a better operational product with a much longer life expectancy. As the inlet water

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water filtration technology

flows into the water conditioner tank, the up flow pulls the water which then passes through the Filter SP3 media. When contact between the media and water has been made, the Filtersorb SP3 acts as catalyst and converts the hard minerals into in active nano crystal particles. These nano crystallized particles break off and flow freely through the system without attaching on to pipes and other hardware components. A secondary benefit is that Filtersorb SP3 media process has a descaling effect on the existing scale already present in pipes, hardware, and equipment. A third benefit is that the Filtersorb SP3 Media also prevents corrosion by adding a 30 micron protective layer to the surface of the pipes and hardware. The overall process of Filtersorb SP3 is virtually maintenance free and does not require backwashing, salt, or electricity.

