SCALEBLASTER®

WATER CONDITIONER

The Sustainable Solution to Hard Water Problems

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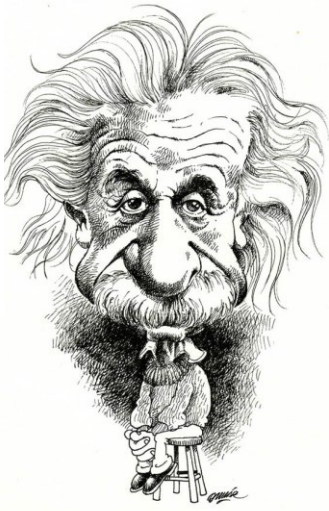

Dealer Handbook

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9th printing. March 2023.

CLEAR WATER ENVIRO TECHNOLOGIES

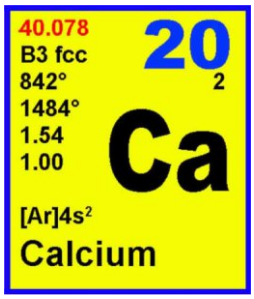
SCALEBLASTER® WATER CONDITIONER

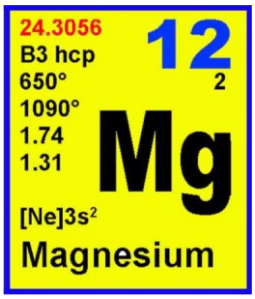
A. - Water Hardness

- What Is Water Hardness?

Hard water is a description for water that contains a high amount of dissolved mineral content, mainly in the form of calcium and magnesium.

Water is considered soft when it falls from the sky as rain. **As it travels through rock and soil it dissolves calcium and magnesium and other minerals.** Unless you have a private well, your tap water is processed by a municipal water treatment plant which removes some of the mineral content and other impurities. Calcium (calcium carbonate) and magnesium will generally not be removed since they are dissolved in the water.





While these minerals aren't harmful at all to your health, they do affect the properties of water and its effectiveness for washing and cleaning. Hardness prevents soap from lathering by causing the development of an insoluble curdy precipitate in the water. Water hardness causes the buildup of limescale.

- Testing For Water Hardness

There are at least ten different scales of hardness measurement that have been used over the years in various countries around the world. The British, Germans and French have used their own system over the years. In North America, only three scales have been used and it is simple to convert between them.

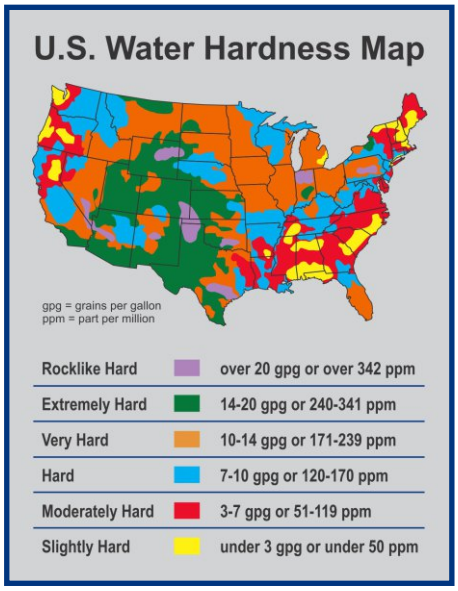
Water hardness is usually expressed in **grains per gallon (gpg)** or **parts per million (ppm)** as the calcium carbonate equivalent. 17.1 parts per million is the equivalent of 1 grain per gallon. So if you want to convert a reading in parts per million, divide that by 17.1 or if you have a reading in grains per gallon and want to convert it to parts per million, multiply it by 17.1 .

In Canada, the municipal water people usually chart the water hardness in mg/L – milligrams per liter. But the easy conversion of mg/L is that it is the same as ppm.

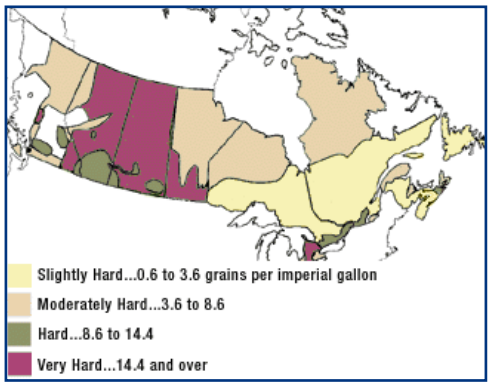
The degree of hardness standard is established by the American Agricultural Society of Engineers (S-369) and the Water Quality Association (WQA).

- Hard Water Around The World

According to the **United States** Geological Survey, 89.3% of the United States is affected by hard water. The softest water occurs in parts of the New England, South Atlantic-Gulf, Pacific Northwest and Hawaii regions. Moderately hard waters are common in many of the rivers of the Tennessee, Great Lakes and Alaska regions. Hard to very hard waters are found in various streams in most of the regions throughout the country. The hardest water (greater than 1,000 ppm) are in streams in Texas, New Mexico, Kansas, Arizona and southern California.

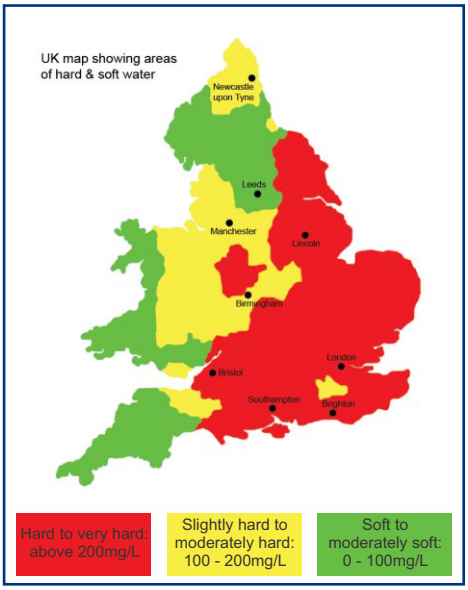


In **Canada,** Prairie Provinces (mainly Saskatchewan and Manitoba) contain high quantities of calcium and magnesium, often as dolomite, which are readily soluble in the groundwater that contains high concentration of trapped carbon dioxide from the last glaciation. In these parts of Canada where the total hardness in ppm of calcium carbonate equivalent, frequently exceed 200 ppm, the groundwater is the only source of potable water. The West Coast, by contrast, has unusually soft water derived mainly form mountain lakes fed by glaciers and snow melt.



Some typical water hardness levels are: Montreal 116ppm, Calgary 165 ppm, Regina 202 ppm, Saskatoon 140 ppm, Winnipeg 77 ppm, Toronto 121 ppm, Vancouver 3 ppm, Charlottetown PEI 140-150 ppm.

In **England and Wales**, information from the British Drinking Water Inspectorate shows that drinking water in England is generally "very hard" in most areas of England, particularly east of a line between the Severn and Tees estuaries, exhibiting above 200 ppm for the calcium carbonate equivalent. Wales, Devon, Cornwall and parts of North-West England are softer water areas, and range from 0 to 200 ppm. In the brewing industry in England and Wales, water is often deliberately hardened with gypsum in the process of Burtonisation.



In **Australia**, analysis of water hardness in major Australian cities by the Australian Water Association shows a range from very soft (Melbourne) to very hard (Adelaide). Total hardness levels of calcium carbonate in ppm are Canberra 40; Melbourne 10-26; Sydney 39.4-60.1; Perth 29-226; Brisbane 100; Adelaide 134-148; Hobart 5.8-34.4; and Darwin 31.

- Grain Conversion -

A grain is defined as a unit of weight equal to 1/7000th of a pound.
One grain = 0.000142857143 Pounds.

A common aspirin tablet is approximately 5 grains.

A house with a water hardness level of 10 grains per gallon, which is considered hard water, would have the equivalent of the weight of two aspirin tablets dissolved in a gallon of water.

- Calcium Hardness Test Kits

You may already know if your water is hard or soft, but having a reliable calcium hardness test kit is a good barometer to judge the actual hardness level. **ScaleBlaster** has its own private labeled calcium hardness test kit made by Taylor Technologies, one of the most trusted names for water testing equipment in the world.

The test kit will actually help you determine the proper residential **ScaleBlaster** model to install (as far as water hardness goes).

The test kit procedures are fairly simple and gives you an immediate and accurate reading.

- Hard Water Problems

Hard water can be a terrible nuisance in household and in commercial/industrial applications.

There are two major problems associated with hard water in residential applications; scale and hard water reacting with soap to form insoluble soap curds. Calcium and magnesium content essentially cause hard water.

- Lime Scale

Lime scale or scale, is a coating or precipitate deposited on surfaces that are in contact with hard water. Water that contains carbonates or bicarbonates of calcium or magnesium is especially likely to cause scale. **When water is heated or evaporation takes place scale minerals precipitate a layer of rocklike deposits inside pipes, water heaters, equipment, fixtures and on glassware.** While most common scale is a result of calcium carbonate, other combinations of ions commonly found in water offer a variety of scale.

These substances include: calcium bicarbonate, calcium sulfate, calcium chloride, magnesium carbonate, magnesium bicarbonate, magnesium sulfate and magnesium chloride.

Various samples of limescale

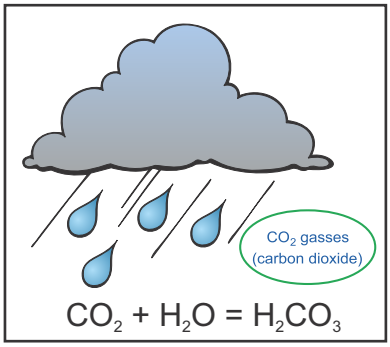
- How Scale Forms

Water Becomes Acidic

Whenever it rains, water (H_2O) in contact with the air will absorb carbon dioxide (CO_2) gas while in the air and form carbonic acid (H_2CO_3).

Acidic Water Dissolves Calcium Carbonate

As the acidic water reaches the surface, it passes over and permeates through rocks such as limestone, marble and seashells, forming soluble calcium ion and bicarbonate ions. The acidic water is dissolving calcium carbonate.



The following chemical reaction takes place:

$$CaCO_3 + H_2CO_3 = Ca^{++} + 2HCO_3$$

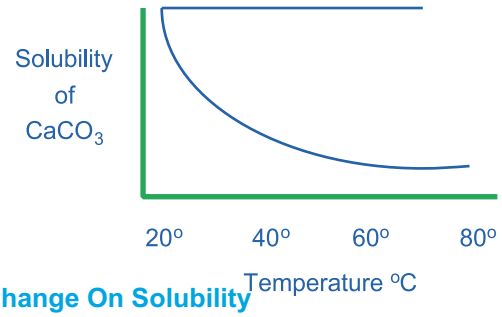
(calcium carbonate) + (carbonic acid) = (in solution™)

- Three Factors That Cause Scale

Any condition which alters the solubility of calcium bicarbonate will result in the precipitation of calcium carbonate (scale). There are three major factors that can alter the solubility of calcium bicarbonate and thus cause scale:

A. Temperature Effect On Solubility

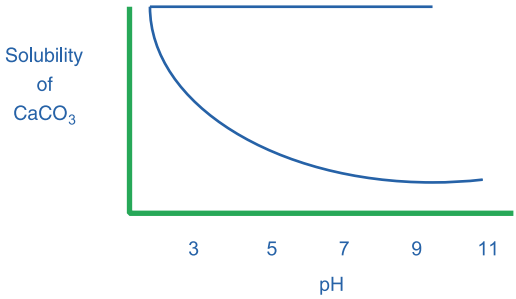
A change from cold to hot water will cause scale to form. When the temperature increases, $C0_2$ evaporates, allowing scale to precipitate. Heating water also causes evaporation, leaving minerals behind.



Heating water is the number one reason for scale formation

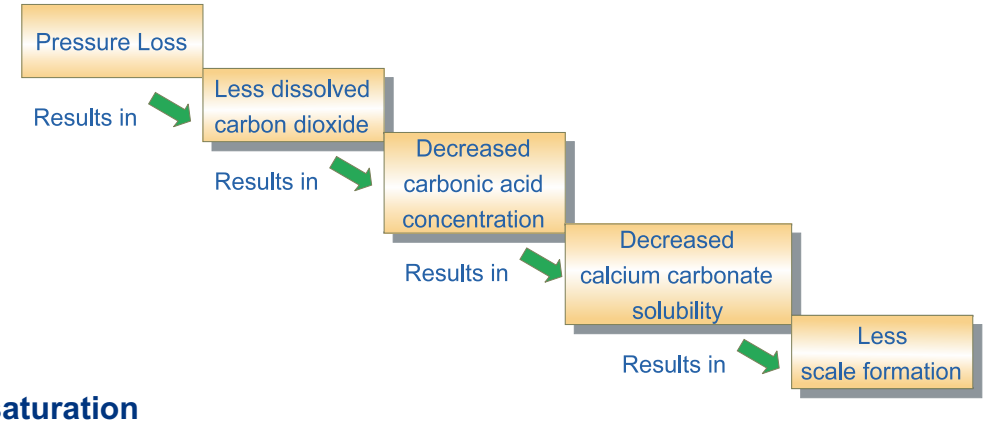
B. pH Change On Solubility

Solubility of $CaCO_3$ decreases with an increase in pH.
The reason? pH is a measure of the acidity of the liquid.
The lower the pH, the higher the acid content.
This will dissolve more calcium carbonate.



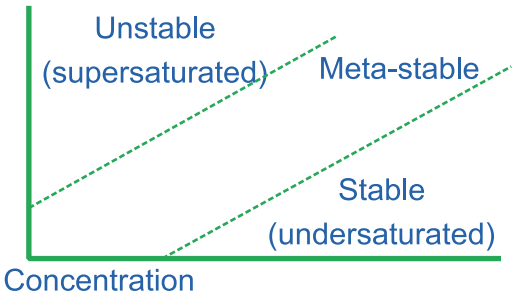
C. Pressure Effect On Solubility

A change in water pressure from high to low will cause scale to form. Pressure drop may occur from internal friction between the molecules of water, external friction between the water and the walls of the piping system or rough area in the channel through which the water flows. At a lower pressure, CO_2 evaporates, thus increasing pH. A higher pH allows for less scale formation.

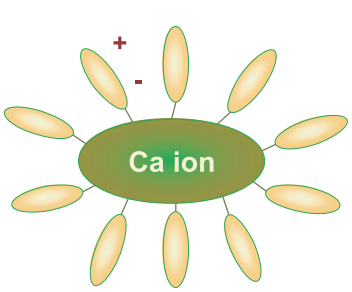


- Supersaturation

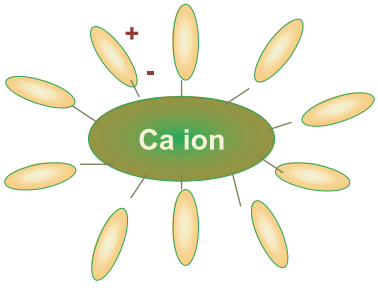
Supersaturation at the point of crystallization is the primary cause of scale deposition. Saturation is the maximum equilibrium concentration of a compound that will dissolve into a solution under a given set of conditions (temperature, pressure, flow velocity, etc.). **"Supersaturation"** can be described best as solutions that contain higher concentrations of dissolved solute than their equilibrium concentration.



To simplify ***Supersaturation***, it can best be described as scale-causing ions that barely "hang in the water". When calcium and bicarbonate ions are hydrated, molecules are attached to the calcium and bicarbonate ions via ionic bonds, which are much stronger than the Van Der Waal force. In a supersaturated solution, the calcium and bicarbonate ions are partially hydrated by water molecules. The harder water is, the calcium and bicarbonate ions are hydrated with much weaker hydration energy. Thus we can conclude that in a supersaturated solution, calcium ions are barely "hanging in water".



Fully hydrated calcium ion - stable undersaturated solution



Partially hydrated calcium ion - unstable supersaturated solution

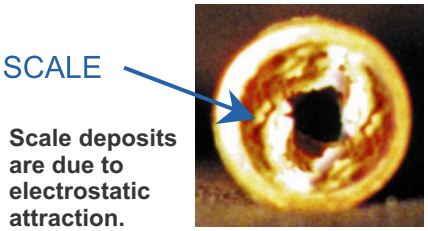
- Causes Of Local Supersaturation

- Increase in temperature
- Increase in pH
- Decrease in pressure
- Agitation of the solution
- Decrease in flow velocity

Even when the bulk solution is less than fully saturated, scale formation can occur due to local **Supersaturation**.

- Nucleation Precipitation

You may be wondering when scale forms, why does it stick to surfaces?



Scale deposits are due to electrostatic attraction.

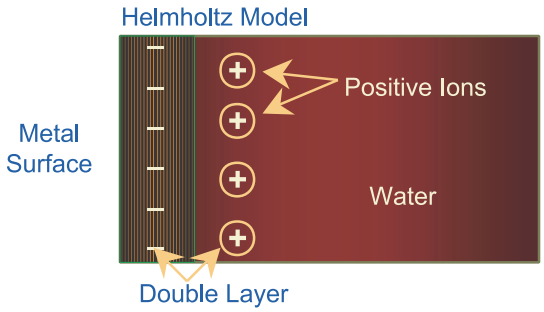
The Answer: The electrostatic attraction between the metal surface and scale-causing minerals. Gravity plays no role in scale formation.

The unique characteristics of scale deposits are its uniformity. Precipitates or crystals formed in one part of a system and carried to another part are less adherent than those crystals formed on site.

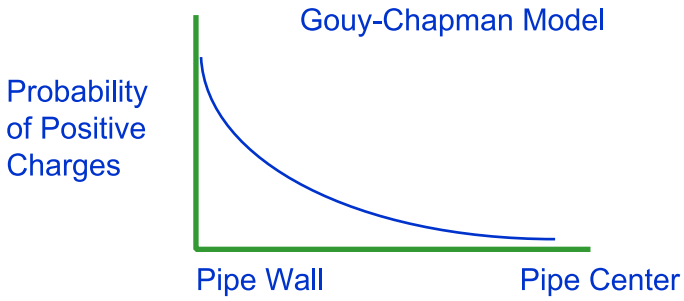
- The Electrostatic Attraction Can Be Described In Three Theories:

A. Helmholtz Model - When a metal is in contact with an ionic solution such as water with scale-producing minerals, the metal surface has a high density of electrons, giving it a locally negative charge.

The solvated positive ions such as H+, Ca++ and Mg++ align themselves along the surface of the metal surface, producing an (electric) double layer--no thermal motion of ions considered.

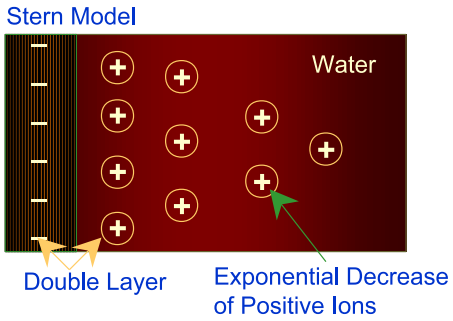


B. The Gouy-Chapman Model - Diffuse Double-layer Due to the thermal motion of the ions in the solution, the population of positive charges (i.e., H+, Ca++ and Mg++) decreases exponentially with increasing distance from the metal surface.



C. Stern Model - The previous two are combined. The positive ions closest to the metal surface are constrained into a rigid Helmholtz plane while outside the plane, the positive ions are dispersed as in the Gouy-Chapman model.

It is this electric potential (or coulombic) difference that causes the attraction of the scale to surfaces, which explains their uniform deposition.



- Common Evidence Of Scale In Residential Applications

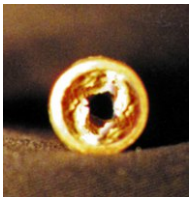
Scale is most visually evident as hard white to off-white deposits that build up in faucets, showerheads and drains. Scale also leaves deposits on dishes, glassware, sinks and counter top surfaces. Scale formation is usually hard and very difficult to clean. Visual references also include fixtures such as toilets, bathtubs, showers and appliances like coffee and ice makers. Swimming pools, spas and evaporator coolers are also common places where scale is easily seen.

While these are only a few of the visual evidences of scale, what about the scale formations that are not visual? Scale will form inside pipes, water heaters, steamers and other equipment using water. Unfortunately, because scale forms a “coating”, it can significantly affect thermotransfer.

Example: A common cooking pot. Suppose one were to place an empty cooking pot on a range-top and turn the heat to the highest setting. It would not take very long before the pan would begin to smoke and even turn red. However, if soup were inside the pan it would take a much longer time for the pan to reach the same temperature. The soup, as a matter of illustration, acts as an insulator, or barrier, which impedes thermotransfer. Scale affects heat transfer in much the same way, but to a much greater degree because of its hard-like consistency and chemical composition.

- Scaling Of Pipes

The formation of scale inside pipes quite often is so great that the pipes completely close. In many more cases, scale formation inside pipes significantly reduce the flow of fluids. Smaller orifices like faucet screens, showerheads or dishwasher jets readily build scale to the point of reduced flow. Scale formation can occur on virtually any surface in contact with water, provided the water has some content of scale forming chemistry – as most water does.



- Besides Scale, What Other Problems Are Associated With Hard Water?

Soap and detergents react with water. The positively charged ions of calcium and magnesium, common in most all water, react with the soap ions (negatively charged) to produce insoluble soap curds. Soap curds produce rings around bathtubs and half-clean, dingy-looking clothes along with a variety of other undesirable effects. Insoluble soap curds also affect hair washing and rinsing. In essence, soap generates much less lather as water hardness increases. You will have to use twice as much soap and shampoo, etc. for washing clothes, dishes and yourself as the hard water reduces soaps ability to lather and does not rinse well. Soap "scum" will build up on bathtubs, sinks, dishes and your skin and hair. Minerals associated with hard water build up on clothing fibers, weakening them and dulling colors. Limescale buildup up on dishes causes unsightly white coating or spots. Minerals can build up on hair and skin, causing dryness and sometimes irritation.




- Is Hard Water Unhealthy?

No! In fact, calcium and magnesium are necessary dietary nutrients. Recent medical studies have indicated a correlation between *lower* heart problems in areas with *high* water hardness. Most of the necessary vitamins and minerals which the human body requires come from food sources, including fluid intake and skin absorption.

- Does Hard Water Affect Beverage Taste?

Absolutely! The content of calcium and magnesium does affect the taste of water and drinks that are made with water. Virtually all of the coffee experts contend that some amount of water hardness is necessary for excellent flavor. Drink taste, however, is a science of perception and is generally dependent on individual preferences. Many people enjoy the taste of mineral water while others prefer the taste of water without any minerals at all (distilled water, for example).

- If Hard Water Minerals Are Good For Us, Why Remove Them?

Don't! Scale caused by hard water has plagued homes and industry for centuries. It has, and does, cost literally billions of dollars in unnecessary energy consumption and manpower. Not until this past century, however, was there a consistently effective method to combat the effects of hard water – the use of ion-exchange in a traditional water softener. While they do solve hard water problems, they remove dietary nutrients such as calcium and magnesium and add salt. Salt and brine discharge are not good for our bodies and the environment. Why remove the calcium if you don't have to?

- Common Evidence Of Scale In Commercial / Industrial Applications

There are several applications where **ScaleBlaster** can remove scale.

Cooling Towers - Huge savings in maintenance, biocide chemicals, labor and water usage. **ScaleBlaster** reduces scale buildup, bacteria, Biofilm, corrosion and algae blooms. It will reduce makeup water/ blow downs substantially, resulting in huge water savings. It will increase life of equipment and lower energy costs by about 10%.

Chillers / Condensers / Air Handlers - Lime scale deposit control on heat exchanger tubes and surfaces resulting in energy savings of 5-7%.

Boilers - Huge savings in chemicals and labor maintenance. Reduces scale formation on boiler fire tubes, condensation tank, pumps, pipes and valves. Lowers energy costs by 25% and extends equipment life.

Water Heater Tanks - Water heaters work more efficiently resulting in huge energy savings. Scale control on heating coil and tank.

Dishwashers - Lime scale buildup in the dishwasher lines and on glassware and dishes will be reduced.

Steamers - Your steamers will require little or no maintenance for scale build-up.

Ice Machines - Scale deposits can cause cubes to be cloudy and clogs in the water flow. **ScaleBlaster** reduces filter clogs, Biofilm and contaminants. Maintenance and downtime are also reduced and equipment lasts longer.

Laundry - Scale deposit control in steam ironing machines, washing machines. You will typically cut detergent use in half. Clothes and towels will feel softer, look brighter and last longer, making your clients feel more pampered.

Drinking Water, Coffee Machines, Soda Dispensers - The water will taste much better because the breeding ground of bacteria (scale in water pipes) is gone. By keeping calcium in the water, coffee and cappuccino will taste better.

Housekeeping / General Cleaning - Huge savings are realized in all phases of cleaning including the bathrooms and in the kitchen because there is less scale buildup in toilets, showers, nozzles and faucets. Reduced labor and savings in cleaning chemicals benefit your bottom line.

Aerators - Aerators will no longer clog up with scale formation, resulting in the elimination of nuisance cleaning and replacement.

Plumbing System - Your entire building's plumbing system will be descaled without any chemicals or replumbing. This results in huge savings in heating costs. If the plumbing ever needed replacement in the building, the cost would be astronomical.

Swimming Pools And Hot Tubs - Lime scale deposit in the filtration equipment and pool walls will be eliminated.

B. - ScaleBlaster, The Electronic Water Conditioner

We often get asked about the history of **ScaleBlaster** and how it works. This section will give you complete information on these topics.

- Describing ScaleBlaster

We often get asked how you can best describe what **ScaleBlaster** is, what it actually does and it's history.

ScaleBlaster is NOT a water softener. A water softener is an ion exchange method that removes water hardness causing minerals calcium and magnesium from the water and replaces them, usually with sodium chloride, or common salt.

ScaleBlaster does not remove anything from the water. It does not "soften" the water physically in any way. **ScaleBlaster** is an *electronic water conditioner.*

- History Of "Electronic Water Conditioning" And "Permanent Magnets"

Electronic water conditioning is a relatively new technology which evolved from the use of magnetic fields in water improvement.

Permanent magnets use a fixed energy field which, under controlled conditions, affects the crystal structure of calcium. *Controlled conditions* are the key factor to the effectiveness of permanent magnets. Magnets have been used widely, and successfully, in the Soviet states and parts of Europe for many decades both in residential applications and more commonly in industrial/marine applications. Because permanent magnets have a fixed magnetic field, and unless they are properly sized and can adjust to flow-rate changes, they often fail to do the job. They also must be properly sized as far as strength goes – to the effect the exact hardness level.

Historically, the performance of permanent magnets has been ultimately reliant on controlled conditions – such as flow rate, their energy levels and fields are fixed. The advent of electronic systems introduced both variable energy and frequency.

Electronic treatment is based on the principal of creating an oscillating field of energy with the use of low frequency radio or square waves. As water passes through a pipe delivering variable frequencies and energy levels – a physical change in the preferred crystal structure of calcium and magnesium occurs.

- ScaleBlaster History

ScaleBlaster was researched and designed in the early 1990s. **ScaleBlaster** is the result of thousands of hours and years of internal joint venture research and development. Field testing in very diverse water conditions from one side of the United States to the other, and in several foreign countries, has yielded what we call the "best electronic water conditioner in the world." Early **ScaleBlaster** prototypes came out in the early 1990s. The first manufactured run of **ScaleBlaster** was the **SB-100,** a residential model that came out in early 1995. Our first commercial installation was on a large company in Clearwater, Florida on their indoor decorative fountain and was combined with a copper/silver ionization system called the *Clearwater Pool Purifier*. In one day, the customer called back raving that the scale deposits had disappeared and that they had discontinued the chlorine use to purify they water. Chlorine smell in an enclosed lobby is not nice. Today, the Clearwater Pool Purifier is called **MineralPURE**.

The first ScaleBlaster model, 1995


The first Clearwater Pool Ionizer ever built, 1990

- Operational Characteristics Of The ScaleBlaster

The **ScaleBlaster** creates a rapidly changing alternating current in a frequency range that exceeds the best estimate of the internal natural frequency of water. The natural frequency of water varies with temperature, pressure, minerals present, pH and other factors. The current is sent through a coil of wire wrapped around a water pipe generating an oscillating magnetic field with the pipe. The rapid oscillation of the magnetic field creates a molecular agitation in the water passing through the field.

It is this agitation which alters the effects of calcium and magnesium carbonates with regard to limescale formation. Scale is either eliminated completely or is reduced to a fine powder easily wiped away. In residential applications, soap curds or scum is no longer a major contributor to bathtub soap scum buildup, dingy looking laundry or other undesirable effects. Industrial benefits are substantial.

- Why ScaleBlaster Is Better Than The Competition

Unlike other electronic descaling devices, the **ScaleBlaster** unit utilizes frequencies in the sonic range and the system design produces energy levels many times greater than those currently delivered by other manufacturers.

Employing these variables allow the **ScaleBlaster** to successfully function in a wide variety of operating conditions. As with most all water improvement technologies, the time in which water is exposed to the energy field, commonly referred to as “resident” time, is an important factor in achieving maximum benefit.

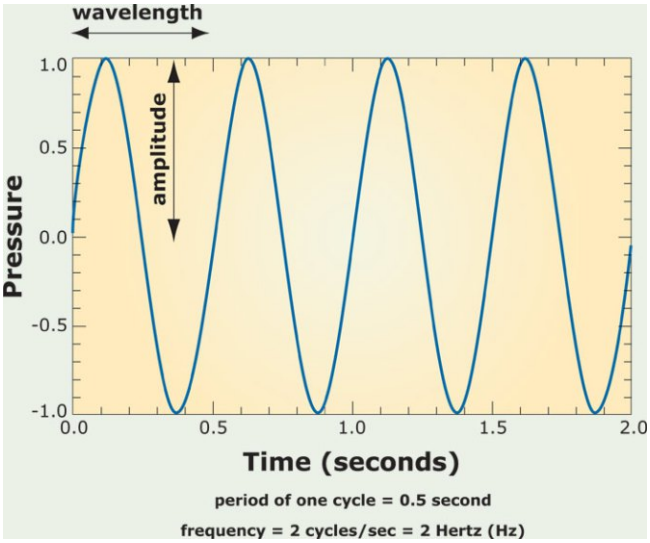
ScaleBlaster systems currently serve pipe diameters between ¼” and 40” pipe and are governed by mathematical calculation of resident time and the proper amount of energy level. Testing for the various sizes of pipes, with various types of pipe (copper, stainless steel, pvc, cpvc, galvanized) combined with various flow rates, water temperature and water hardness levels created an enormous testing parameter for our engineers to develop and design. Such a project is result of a decade of research and hundreds of thousands of dollars.

ScaleBlaster is the only manufacturer in the world that sells electronic water conditioners in the residential, commercial and industrial fields – for all possible applications – and up to 40” pipe. There are several models designed to “fit” every pipe size.

With high success rates superior to our competition, **ScaleBlaster** was able to grow fast in the mid 1990s, and was featured on HGTV in 2005 and 2015, DIY in 2015 and again in 2016. Today, our equipment is on some of the largest companies in the world, and is on hundreds of power plants in China and Mexico.

- Natural Frequency

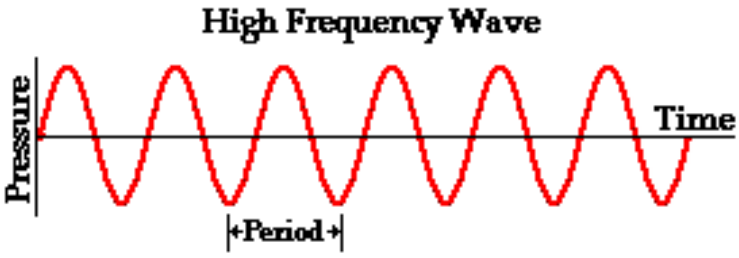
As we mentioned earlier, **ScaleBlaster** creates a rapidly changing alternating current in a frequency range that exceeds the best estimate of the internal natural frequency of water. First, we need to explain what a sound wave is and what "natural frequency" means.

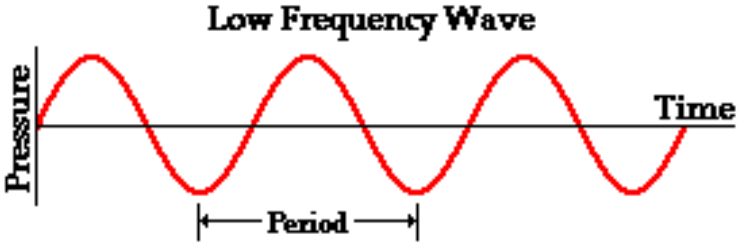


A sound wave, like any other wave, is introduced into a medium by a vibrating object. The vibrating object is the source of the disturbance that moves through the medium. The vibrating object that creates the disturbance could be the vocal cords of a person, the vibrating string and sound board of a guitar or violin, the vibrating tines of a tuning fork, or the vibrating diaphragm of a radio speaker. Regardless of what vibrating object is creating the sound wave, the particle of the medium through which the sound moves is vibrating in a back and forth motion at a given **frequency**. The frequency of a wave refers to how often the particles of the medium vibrate when a wave passes through the medium. The frequency of a wave is measured as the number of complete back-and-forth vibrations of a particle of the medium per unit of time. If a particle of air undergoes 1000 longitudinal vibrations in 2 seconds, then the frequency of the wave would be 500 vibrations per second. A commonly used unit for frequency is the Hertz (abbreviated Hz), where as a sound wave moves through a medium,

1 Hertz = 1 vibration/second

each particle of the medium vibrates at the same frequency. This is sensible since each particle vibrates due to the motion of its nearest neighbor. The first particle of the medium begins vibrating, at say 500 Hz, and begins to set the second particle into vibrational motion at the same frequency of 500 Hz. The second particle begins vibrating at 500 Hz and thus sets the third particle of the medium into vibrational motion at 500 Hz. The process continues throughout the medium; each particle vibrates at the same frequency. And of course the frequency at which each particle vibrates is the same as the frequency of the original source of the sound wave. Subsequently, a guitar string vibrating at 500 Hz will set the air particles in the room vibrating at the same frequency of 500 Hz, which carries a sound *signal* to the ear of a listener, which is detected as a 500 Hz sound wave.





Since a pressure-time plot shows the fluctuations in pressure over time, the period of the sound wave can be found by measuring the time between successive high pressure points (corresponding to the compressions) or the time between successive low pressure points (corresponding to the rarefactions). The frequency is simply the reciprocal of the period. For this reason, a sound wave with a high frequency would correspond to a pressure time plot with a small period - that

is, a plot corresponding to a small amount of time between successive high pressure points. Conversely, a sound wave with a low frequency would correspond to a pressure time plot with a large period - that is, a plot corresponding to a large amount of time between successive high-pressure points. The diagram below shows two pressure-time plots, one corresponding to a high frequency and the other to a low frequency.

The ears of a human (and other animals) are sensitive detectors capable of detecting the fluctuations in air pressure that impinge upon the eardrum. It is sufficient to say that the human ear is capable of detecting sound waves with a wide range of frequencies, ranging between approximately 20 Hz to 20,000 Hz. Any sound with a frequency below the audible range of hearing (i.e., less than 20 Hz) is known as an **infrasound** and any sound with a frequency above the audible range of hearing (i.e., more than 20,000 Hz) is known as an **ultrasound**. Humans are not alone in their ability to detect a wide range of frequencies. Dogs can detect frequencies as low as approximately 50 Hz and as high as 45,000 Hz. Cats can detect frequencies as low as approximately 45 Hz and as high as 85,000 Hz. Bats, being nocturnal creature, must rely on sound echolocation for navigation and hunting. Bats can detect frequencies as high as 120,000 Hz. Dolphins can detect frequencies as high as 200,000 Hz. While dogs, cats, bats and dolphins have an unusual ability to detect ultrasound, an elephant possesses the unusual ability to detect infrasound, having an audible range from approximately 5 Hz to approximately 10,000 Hz.

A sound wave is created as a result of a vibrating object. Any object that vibrates will create a sound. The sound could be musical or it could be noisy; but regardless of its quality, the sound wave is created by a vibrating object.

Nearly all objects, when hit or struck or plucked or strummed or somehow disturbed, will vibrate. If you drop a meter stick or pencil on the floor, it will begin to vibrate. If you pluck a guitar string, it will begin to vibrate. If you blow over the top of a pop bottle, the air inside will vibrate. When each of these objects vibrates, they tend to vibrate at a particular frequency or a set of frequencies. The frequency or frequencies at which an object tends to vibrate with when hit, struck, plucked, strummed or somehow disturbed is known as the **natural frequency** of the object. If the amplitudes of the vibrations are large enough and if natural frequency is within the human frequency range, then the vibrating object will produce sound waves that are audible. **ScaleBlaster's** sound is inaudible to the human ear.

frequency = speed/wavelength

All objects have a natural frequency or set of frequencies at which they vibrate. The actual frequency at which an object will vibrate at is determined by a variety of factors. Each of these factors will either affect the wavelength or the speed of the object. Since an alteration in either speed or wavelength will result in an alteration of the natural frequency.

- How Does ScaleBlaster Eliminate Limescale?

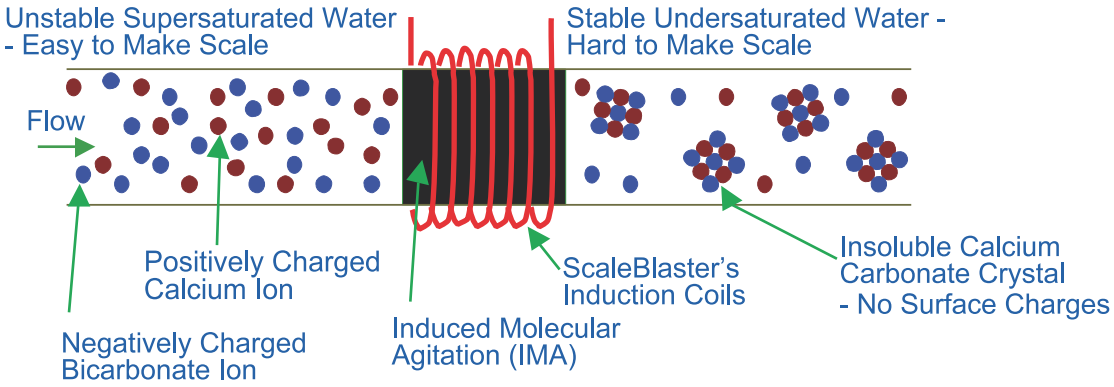
ScaleBlaster unit is composed of a signal cable that is wrapped several times around a pipe and an electronic unit that sends out a complex, dynamic current to produce extremely small, time-varying, oscillating fields inside the pipe. This electronic unit is available in several sizes in terms of power strength. The larger the size of the pipe, the more power is required. The current that produces an oscillating field is known as Ampere's Law.

ScaleBlaster signal produces a unique square wave current that sweeps all the frequency responses from 1,000 - 20,000 Hz at a rate of 20 times a second. When the strength of the oscillating field varies with time and changes direction, an induced current is produced inside the pipe, a phenomenon known as Faraday's Law of Induction. This induced, oscillating electric field provides the necessary molecular agitation for scale prevention and removal.

- Induced Molecular Agitation (IMA)

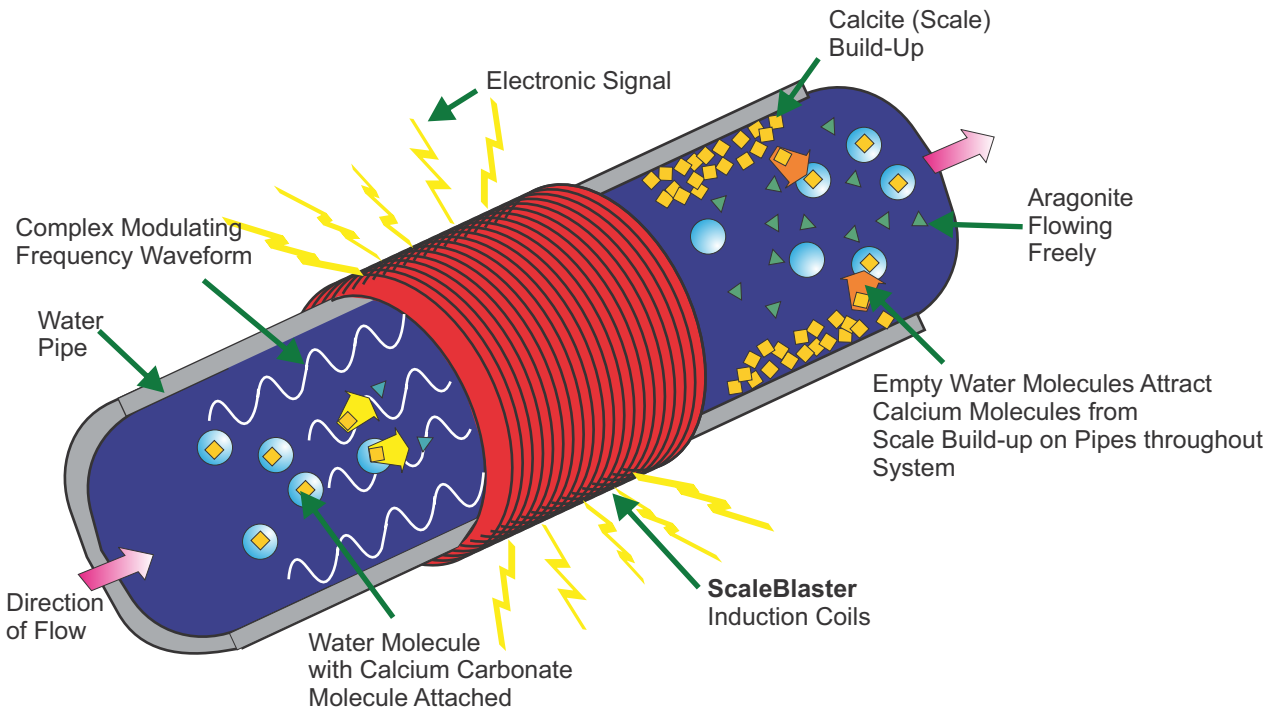
The induced molecular agitation (IMA) of the **ScaleBlaster** technology causes the unstable mineral ions to precipitate, providing initial nucleation sites for further precipitation of adjacent mineral ions. A snowball effect starts, resulting in growth of many crystals, each consisting of numerous mineral ions. These insoluble crystal salts become large in size and float with water, thus they do not stick to the metal surfaces because the crystals do not have the charges at the surface anymore.

ScaleBlaster's Square Wave Current



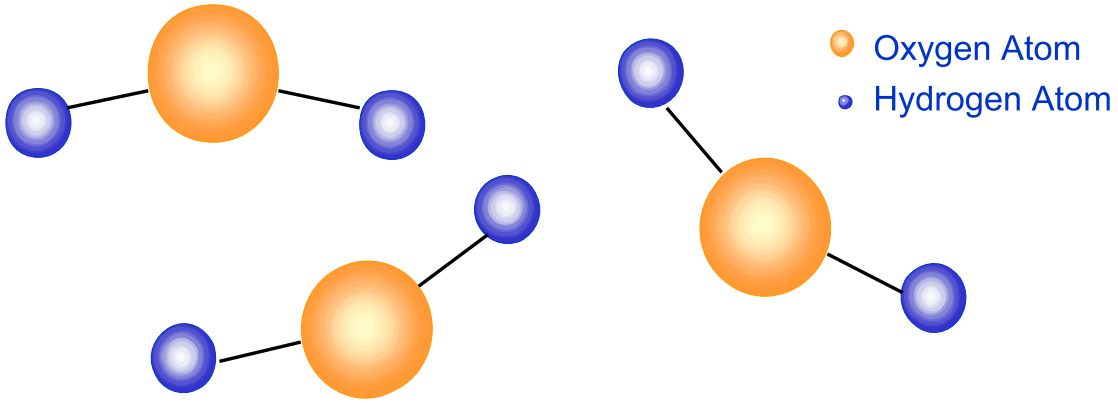
- Removing Existing Scale

As the by-products of the precipitation and snowball effect of mineral particles, the free water molecules become available to dissolve existing scale. In other words, the electronic signal generated through the **ScaleBlaster** induction coil breaks apart water molecules with calcium carbonate attached and thus becomes an empty water molecule that immediately begins to attract calcium molecules from scale buildup on pipes throughout the system.



- Water Molecules

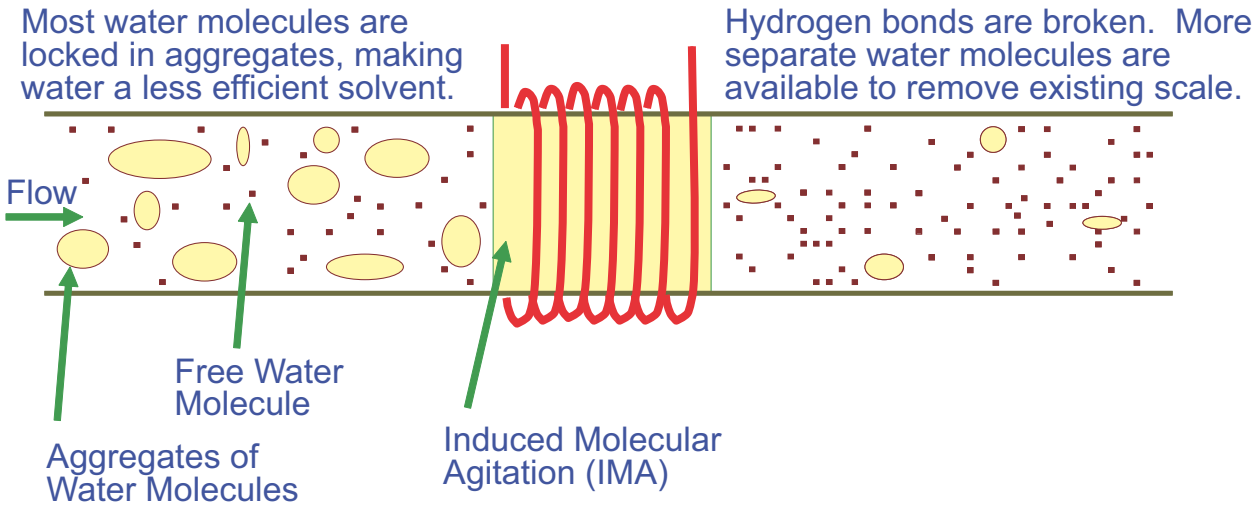
It is well known in water chemistry that most water molecules are locked in aggregates in liquid water and less than 20% exists as free water molecules. This is because water molecules have a dipole moment - the hydrogen atom is attracted to the oxygen atom of the adjacent water molecule. The frequency modulation technology developed by **ScaleBlaster** allows the induced electrical agitation to tune to the natural frequency of the water molecules vibrating in the aggregates. Through the cooperative resonance of the water molecules, free water molecules become available, dissolving existing scale in the pipe.



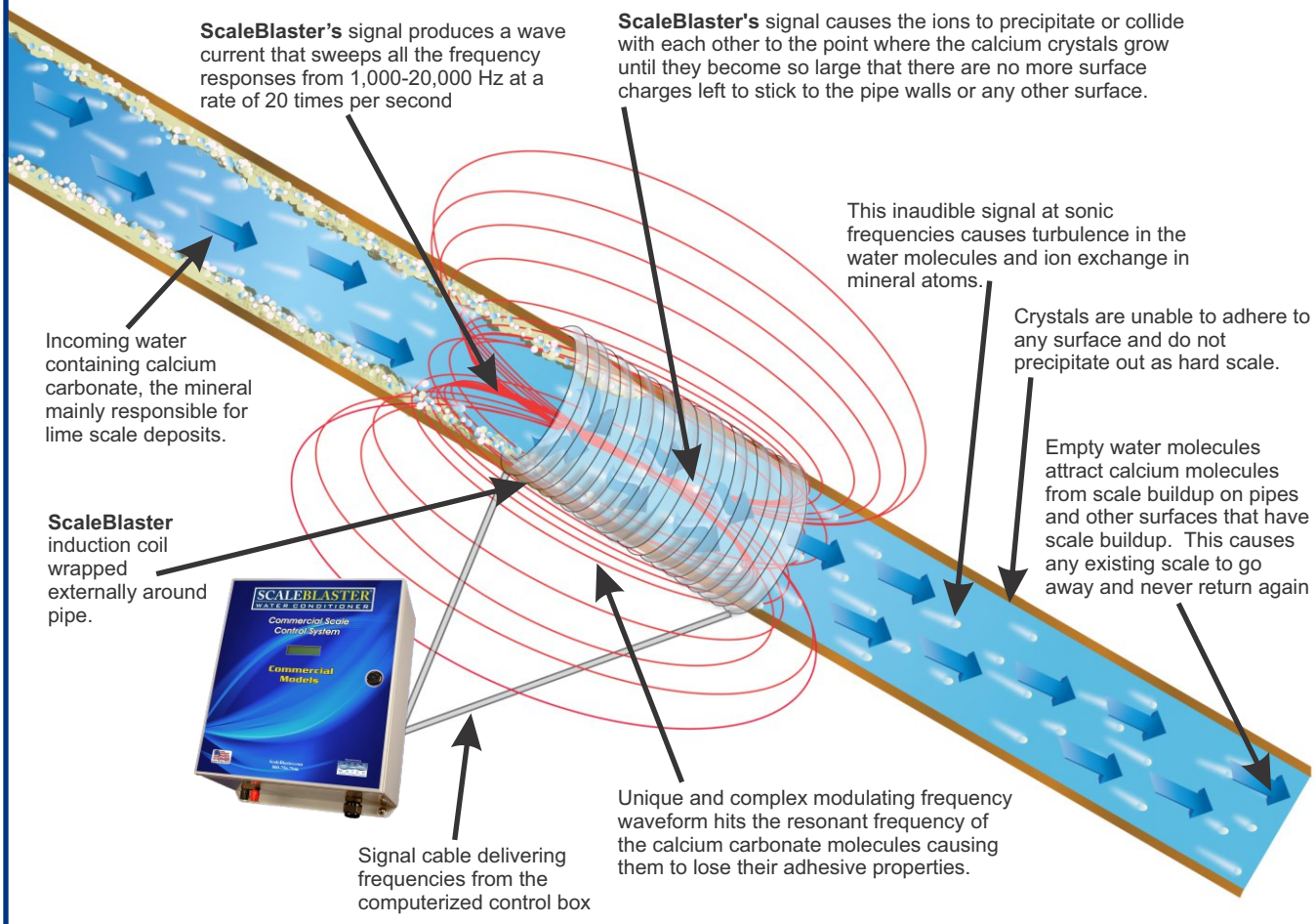
- Breaking Down The Hydrogen Bonds Of Water Molecules

Schematic diagram of the operation of **ScaleBlaster**: Aggregates of water molecules contain most water molecules in liquid water. Induced molecular agitation breaks hydrogen bonds in aggregates, and separate water molecules become available, removing existing scale.

ScaleBlaster's Square Wave Current



- ScaleBlaster Signal Theory



- Ampere's Law

Physical Law on the "IMA" - **ScaleBlaster** signal produces an IMA, induced molecular agitation which will be fully described in this section.

As reported earlier in this chapter, the **ScaleBlaster** unit involves an electric unit and a signal cable that is wound around the outside wall of the pipe. The unit supplies a current inside the coil to produce a magnetic field

Ampere's Law

$$B = \mu_{\bullet} nI$$

Where B = resulting field vector

The "right-hand rule" determines the direction of the magnetic field inside the pipe. The strength of the magnetic field is proportional to the product of the current and the number of turns in the coil.

- Faraday's Law Of Induction

ScaleBlaster changes the current in the coil 20 times a second. This is done by a frequency-modulated square wave signal. When the strength of the magnetic field varies with time, an induced current is produced inside the pipe. This is known as Faraday's Law of Induction.

Faraday's Law of Induction

$$\int E \cdot ds = - \frac{\partial}{\partial t} \int B \cdot dA$$

Where E = induced electric field vector

This induced current, when supplied with the proper amount of DC current in milliamps, produces this induced molecular agitation to take place at the coil. The strength of this electric field is important

- Physical Laws Of Induced Molecular Agitation (IMA).

As we have mentioned before, a wire is wound several times on the outside of the pipe, thus creating a solenoid coil. When there is a current flowing in the solenoid coil, a magnetic field is produced called Ampere's Law. The right-hand rule determines the direction of the magnetic field inside the pipe. The strength of the magnetic field is proportional to the product of the current, I, and the number of turns of coil, N.

B = y on I
Where B = magnetic field vector
[Wb/m2 or Ns/Cm]

The magnetic strength produced by **ScaleBlaster's** solenoid coil is much smaller than that of permanent magnets.

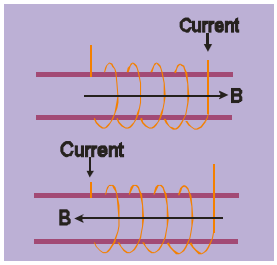
- Comparison Of Strength Of Various Magnets

ScaleBlaster -	0.2 - 1.0 Gauss
Simple "Refrigerator" Magnet -	100 Gauss
Bar Magnet -	100 - 1,000 Gauss
Magnets Intended to Remove Scale -	4,000 - 6,000 Gauss
Large Scientific Magnets -	20,000 - 40,000 Gauss
Superconductivity Magnets -	5,000,000 - 10,000,000 Gauss

As you can see, **ScaleBlaster** does not rely on the strength of the magnetic field at all. The strength of the magnetic field produced by **ScaleBlaster** is about 1/1000 of a simple refrigerator magnet that you use to hold notes in the kitchen!

- Changing The Direction Of The Current In The Coil

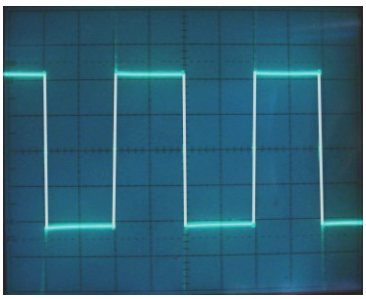
ScaleBlaster changes the direction of the current in the coil 20 times per second. Thus, the magnetic field inside the pipe also changes 20 times per second. This step is called "frequency modulation". This frequency modulation is necessary because no one knows the natural frequency of supersaturated water – water where the calcium ions "are barely hanging on". This is the key to **ScaleBlaster's** success.



As you will see in the rest of this section, hitting the supersaturated's "barely hanging in water" ions with the natural frequency is imperative for the **ScaleBlaster** to perform regardless of flow-rate and hardness level. This is when most permanent magnets fail to do the job.

- The Natural Frequency Of Water

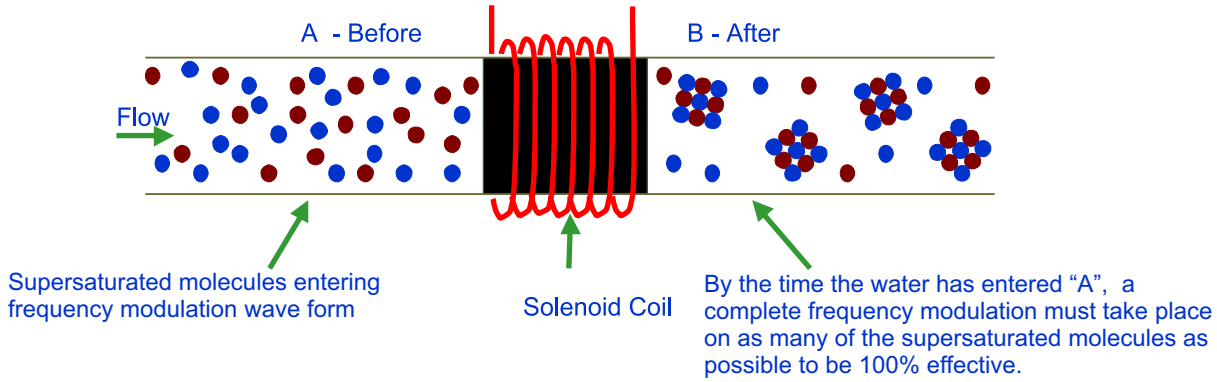
The natural frequency of the supersaturated water critically depends on its viscosity (the tendency of a fluid to resist flowing due to internal forces such as the attraction of the molecules for each other or the friction of the molecules during flow) and water temperature. Since it is impossible to determine the natural frequency of water being treated in any given situation, a frequency modulation method needs to "self-tune" to the natural frequency of the water.



In order to change the direction of the current, **ScaleBlaster's** technology uses a pulsing or alternate current of a square wave type. **ScaleBlaster** will change the current in the coil 20 times per second. It is this change of current that created a rapid magnetic flux change. It is imperative to create as rapid a change in polarities as possible to achieve proper treatment of the water. This complete frequency modulation must be done during the time the water is passing through the induced coil to hit the resonance frequency of as many supersaturated molecules as possible. This is critical to the success of the **ScaleBlaster.** It is where most others fail.

- Flow Rates

All flow rates vary as do pipe sizes. So a unit must be as sophisticated as the **ScaleBlaster** to be successful.



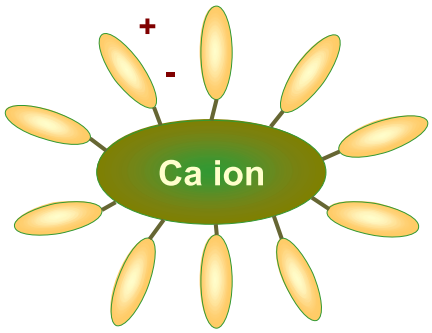
- Wrapping The Coil

It is important to have the correct amount of wrapping of coil around the pipe. Too little will cause all the supersaturated molecules from not being "fine tuned" to the natural frequency as the water passes the coil. In other words, a coil only wrapped ½ way may, in theory, hit only ½ the water. The descaling process would take twice as long and the surface tension of the water molecules would not be altered much to notice any effects of the descaled water.

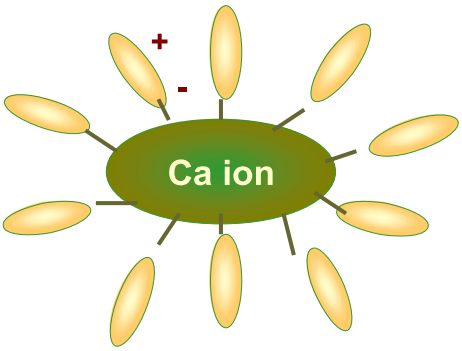
When the current changes, the corresponding magnetic field changes its direction from the right to the left. When the magnetic field varies with time, an induced current is produced inside the pipe according to Faraday's law of induction.

- Supersaturated Water

As the supersaturated water is being treated by the "IMA", the calcium and bicarbonate ions are barely hanging in water collide with each other. Since these ions are not fully hydrated, the collision easily results in a solid calcium carbonate, creating a nucleation site.



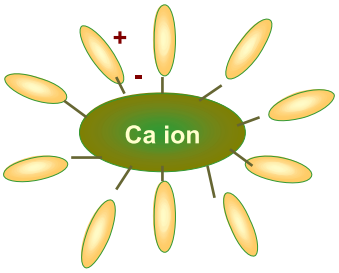
Fully hydrated calcium ion
- stable undersaturated solution



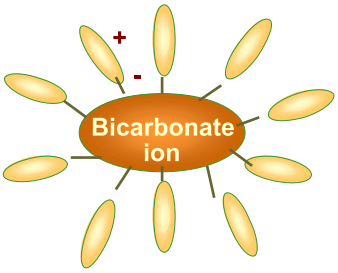
Partially hydrated calcium ion
- unstable supersaturated solution

- Snowball Effect

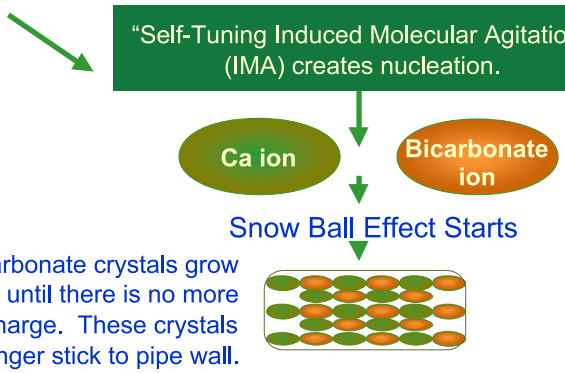
Once the new nucleation site becomes available, the snowball effect of precipitation occurs. A snowball of calcium carbonate will grow until it becomes so large that there are no more surface charges left to attract other "partially hydrated" calcium and bicarbonate ions. A large number of "partially hydrated" calcium ions are precipitated, thus removed from the supersaturated solution. Subsequently, the unstable "undersaturated" solution and the scale buildup stops.



Partially hydrated calcium ion
- unstable supersaturated solution



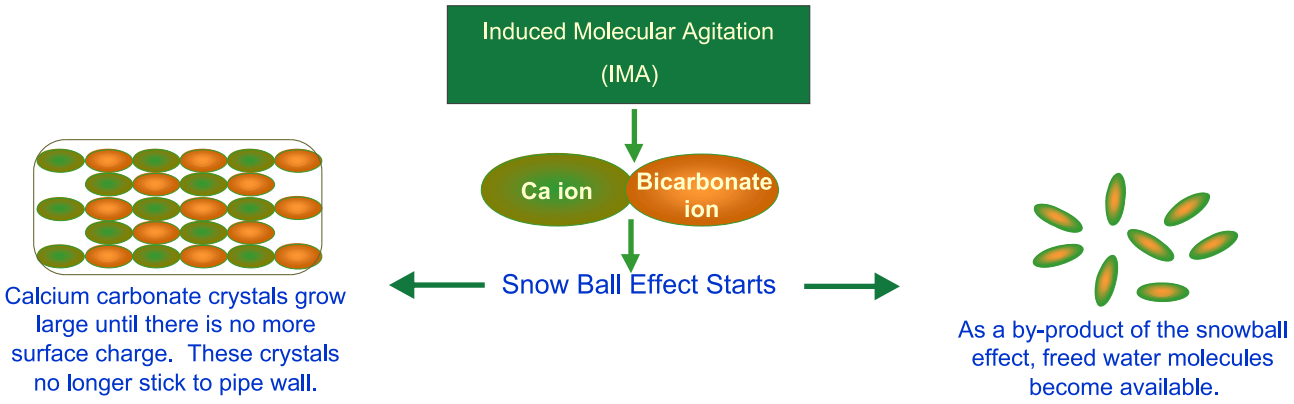
Partially hydrated bicarbonate ion
- unstable supersaturated solution



- Crystals Grow Too Large And Lose Surface Charge

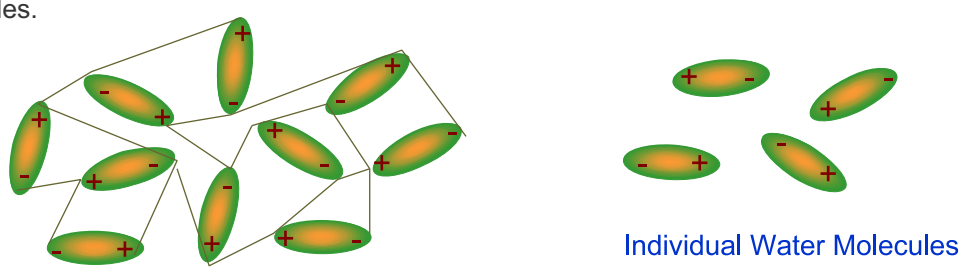
We mentioned earlier that scale-causing ions (calcium and bicarbonate ions) are barely "hanging in water" in a supersaturated solution. When "poorly dissolved" calcium and bicarbonate ions are removed from the supersaturated solution through nucleation and precipitation, those ions which are not involved in the precipitation become dynamic equilibrium.

As the dissolved calcium and bicarbonate ions precipitate and are removed from the supersaturated solution through crystal growth, excess water molecules become available. These water molecules will either recombine with neighboring water molecules, thus locked in clusters of water or be used to fully hydrate the "poorly hydrated" calcium and bicarbonate ions which are barely hanging in water. Since the surface charges of calcium and bicarbonate ions are greater than that of water molecules, the temporarily freed water molecules are likely to be attracted to the surfaces of scale-causing ions.



- Hydrogen Bond

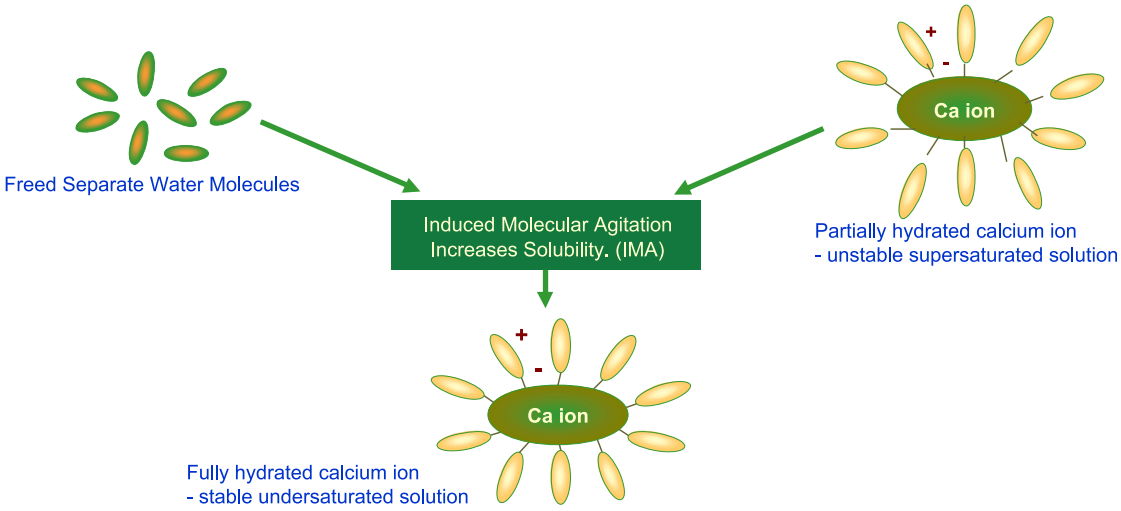
ScaleBlaster's technology takes advantage of the unique characteristics of water, the polar molecule. The positive hydrogen of one water molecule is strongly attracted to the negative oxygen of a neighboring water molecule and the connecting force is the van der Waal force, often referred to simply as "hydrogen bond". In the liquid water, there is a mixture of separate individual water molecules and aggregates of hydrogen-bonded water molecules. The water molecules in the aggregates do not function as efficiently as solvent as the separate water molecules.



- Increasing Solubility

ScaleBlaster technology generates a self-tuning induction using the frequency modulation with its specially designed square wave form. This self-tuning dynamic induction automatically tunes to the natural frequencies of vibrating water molecules, producing a resonance between the vibrating water molecules and the dynamic induction. The resonance breaks the hydrogen bonds in a cluster of liquid water, freeing water molecules. Since the solubility depends on the number of available separate water molecules, this process of breaking hydrogen bonds dramatically increases the solubility of water.

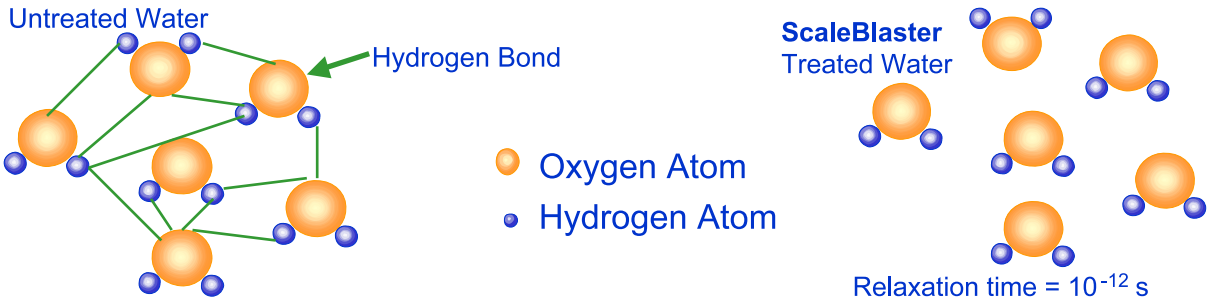
The freed individual water molecules will either recombine with neighboring water molecules or surround (hydrate) the calcium ions. The latter is what actually happens. In a supersaturated solution, the calcium and bicarbonate ions are partially hydrated, i.e., barely "hanging in water", which is the reason they are unstable. Since the surface charges of the calcium and bicarbonate ions are greater than that of the water molecule, the freed water molecules will surround the calcium and bicarbonate ions which are not involved in the previously mentioned precipitation, thus fully hydrating them. Subsequently, the unstable supersaturated solution becomes a stable, under saturated solution and the scale buildup stops.



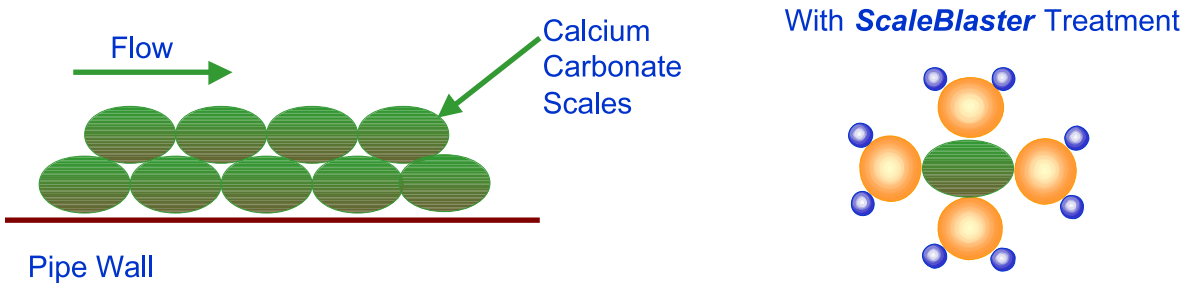
- How The Descaling Process Works

Water molecules are interconnected via hydrogen bonds. They are not readily available to dissolve minerals and chemicals.

The hydrogen bonds are broken, freeing individual water molecules, making water molecules available to minerals and chemicals. This is accomplished with a time varying Magnetic field inside the pipe at 1,000 - 20,000Hz (Faraday's Law of Induction combined with **ScaleBlaster's** square wave signal, IMA)



- The Hypothesis Of Descaling Process



- The Natural Frequency Of The Vibration Of Water Molecules

The key to **ScaleBlaster's** success is the way our "IMA" field hits the resonance frequency of the water molecules. As we have mentioned before, **ScaleBlaster** changes the current 2,000 - 40,000 times a second. The actual cycle is 1,000 - 20,000 Hz a second as we alternate from + 5 volts to - 5 volts.

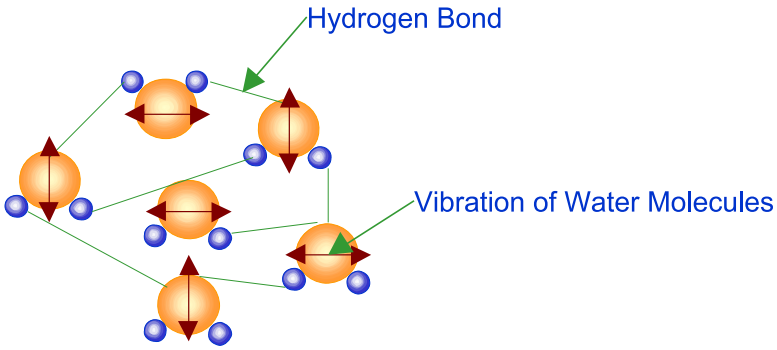
$$\frac{+5}{-5} = 0 \text{ volts}$$

This produces 2,000 - 40,000 pulses of energy every second. Many experts have estimated the internal frequency of water as:

f = 1,000 - 10,000 Hz

The **ScaleBlaster** easily falls in this range and by changing the current it creates a rapid magnetic flux change. It is critical to create as rapid of a change in the polarities as possible to properly treat the water.

- The Mechanism Of Breaking The Hydrogen Bond Is Resonance!



When the external disturbance provided by **ScaleBlaster** matches the natural frequency of the hydrogen atom, the hydrogen bonds are broken instantly. It is important that **ScaleBlaster's** frequency range exceeds the best estimate of the internal natural frequency of water because this natural frequency can vary with temperature, pressure, minerals present, pH and other factors.

- UL/CUL Approvals

Most of our electronic descalers are UL approved. UL is short for Underwriters Laboratories, and are a non-profit organization. They were established in 1894 and develop standards and test procedures for products, materials, components, assemblies, tools and equipment. They are most concerned about product safety.

The UL logo can be seen on virtually every electrical product in the country, except Easy Water, one of our competitors. Many large companies will require having the unit UL listed as far as electrical safely goes. UL is one of several companies approved for such testing by the U.S. federal agency OSHA.

Today, UL operates in 104 countries, has 64 laboratory/facilities for testing and certification with a staff of 12,000.

Obtaining and maintaining UL is costly and involves on-site quarterly visits from the company. Failure to confirm to their codes you have been approved for can land you heavy fines, and the pulling of product off your inventory shelves.

The CUL approval mark with the "C " indicates that the device complies with the applicable Canadian standard.

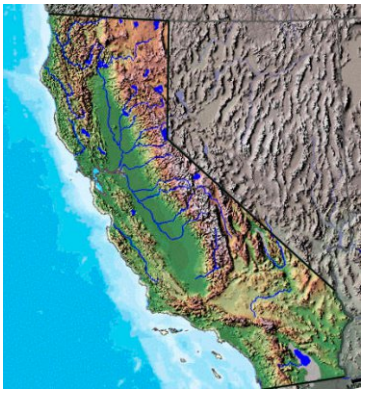
- - Commonly Asked Questions - -

- What Is The Difference Between Scaleblaster And A Water Softener?

They are not the same in any shape, way or manner. **ScaleBlaster** is a “healthy” and “green” **alternative** to water softeners. Water softeners exchange calcium and magnesium ions with twice as many sodium ions. This process is an ion exchange method that requires the adding of bags of salt on a regular basis. **ScaleBlaster** does not remove the calcium from the water, so the results of a water softener vs. **ScaleBlaster** are not the same – as far as residential units go. If the water softener is used solely for scale elimination in commercial and industrial applications, the results are the same.

- Are Water Softeners Getting Banned?

There are several states that have instituted restriction at state, city or country levels regarding the discharge of regenerative water softeners into the sanitary sewer systems. Full outright bans have been instituted in cities like Santa Clarita and Fillmore, California in the discharge of brine back into the water stream.



California

Although California does not have a statewide water softener ban in place, in 2005 lawmakers passed Assembly Bill 1366. It states that local water districts have the right to impose a ban on self-regenerating water softeners if they determine that such a ban is required in order to satisfy discharge standards set by the state. Furthermore, the bill mandates that local water districts must provide advance notice and hold public meetings if they choose to issue a ban on water softeners. The reason for the bill's passage is to prevent treated soft water dispensed as wastewater from increasing the sodium content of the water supply and diminishing crop yields when the water is recycled and used for irrigation.

As of January 1, 2009, salt-based water softeners officially became illegal in Santa Clarita to protect the Santa Clara River. Other California cities have followed suit, including, Chino, Chino Hills, Fontana, Montclair, Upland, Cucamonga Valley and Monte Vista Water Districts. Other communities affected by this ordinance include Saugus, Valencia, Newhall, Castaic, Canyon County, Stevenson Ranch, Fair Oaks Ranch, Bouquet Canyon, Mint Canyon and Forrest Park.

Communities that are served by septic tanks instead of the public sewer systems are not affected by this ordinance.

- “Exchange Tank” Option

This does not stop the use of a water softener, but stops the use of self-regenerating water softeners. There are companies that can use the “exchange tank” systems that would require them coming to the household once a month and switch out the tank with a “fresh” one. The tank is then regenerated at the company's plant. The residual is then dumped into a brine line which has no contact with the sewer system.

Michigan

In May of 2010, Hamburg Township prohibited the use of salt water softeners, in order to protect their aquifers from excessive sodium.

Connecticut

Brine discharge from the salt water softeners is prohibited from entering private septic systems by the CT Public Health Code, in order to protect against groundwater contamination and damage to septic systems

Massachusetts

Brine discharge from salt water softeners is prohibited from entering private septic systems by Massachusette Department of Environmental Protection Title 5 regulations.

IEUA Actions

The Inland Empire Utilities Agency is a municipal water district located in western San Bernardino County, California. The Agency's mission is to supply imported drinking water and recycled water, to collect and treat wastewater, and provide other utility-related services to the 850,000 residents living within its service area.

The agency is banning the installation of any new salt-based softeners

Here is an opinion by Terry Catlin, Inland Empire Utilities Agency Board of Directors:

For Our Water's Sake, Use Water Softener Alternatives

Protecting water quality and local water supplies is critically important to our region's economic future. This is why, on July 20th, the Inland Empire Utilities Agency – with unanimous support from residents, businesses, environmentalists, local cities and other water and wastewater agencies – adopted a new regional ordinance prohibiting the new installation or replacement of certain residential self-regenerating water softeners – the type to which you add salt and directly discharges brine to the wastewater system.

Residents and businesses in the Inland Empire have invested hundreds of millions of dollars in the development of local recycled water and groundwater supplies to drought proof our economy. And it has worked.

In the last ten years, we increased our local water supplies by 50% and reduced our region's dependence on costly and unreliable imported water supplies. When the drought hit – one of the worst water crises in our state's history – our communities were prepared. We supplied recycled water to schools, local businesses and public parkways, pumped additional groundwater, and saved water through conservation programs.

Good news, right? So what is our region's greatest water challenge? Salt! Salt is the single most important constraint on our future ability to use recycled water and groundwater.

That is why our cities and water agencies are so concerned about the use of traditional residential self-regenerating water softeners. These softeners – the type that require the use of bags and bags of salt to make the equipment work -- can contribute up to 30 pounds of salt each month into our community's water treatment system.

That is a pound of salt per day! If the wastewater gets too salty from the discharges from these softeners, it becomes unusable or tremendously expensive (over $400 million in additional treatment costs) to remove enough salt to make it usable for recycled water and groundwater recharge.

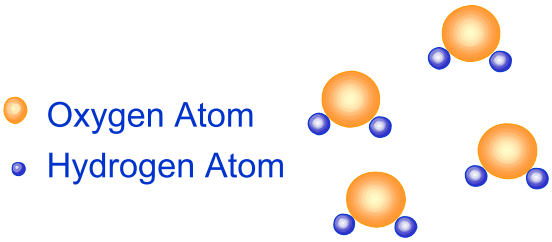
There are alternatives to this one type of water softener that IEUA is regulating. Non-salt using devices are available that protects homes
from the effects of hard water.

Texas

Lawmakers in Texas passed a statewide ban on water softeners in 2001. The regulation averts water softener discharge and reverse-osmosis back flush from entering on-site sewage facilities (OSSF) – otherwise known as septic systems. The regulation was passed in an effort to prevent harm from potentially occurring to septic systems that receive treated water with high concentrations of sodium.

- Where Does The Scale Go After Passing The Signal Cable?

It basically dissolves - molecule by molecule – back into the water – where it belongs. In some circumstances, some scaling may get caught in aerators and shower heads during the initial descaling process.



- Does Scaleblaster Remove Or Kill Bacteria?

ScaleBlaster does not kill bacteria, but it does remove the main breeding ground for bacteria – limescale deposits. When the scale is removed, so is the breeding ground.

- How Long Will The Signal Last?

The signal charge will last up to 110 hours. If you are gone for the holiday or on a vacation for more than that time, the water may revert back to its old “charge”. This will not cause any harm and once you have used up the water in the hot water tank, the water in the household will be back to normal.

We often get inquires right after the holidays that their **ScaleBlaster** unit stopped working. When told to wait till the existing water in the hot water tank is used up (usually by the next day) they will be back to “normal” again, and to call back in a couple of days - if the problem continues. They never call back.

- Does Scaleblaster Affect Iron Or Sulfur In The Water?

ScaleBlaster will not affect iron in the water, nor will levels of iron in the water affect the unit from working. If a customer had a water softener for the use of removing iron in the water, they should continue to use the softener or purchase as iron removal filtration system. Sulfur will not be affected either by **ScaleBlaster,** but on occasion we get customers that swear their water has lost “that rotten egg smell” to it.

- Will Scaleblaster Help With Rust Stains?

We get many who claim **ScaleBlaster** helps with rust stains, but we have no scientific proof that it does. If the stain is part of a calcium/magnesium deposit, it will go away when the calcium/magnesium is dissolved.

- Will Scaleblaster Help With Manganese?

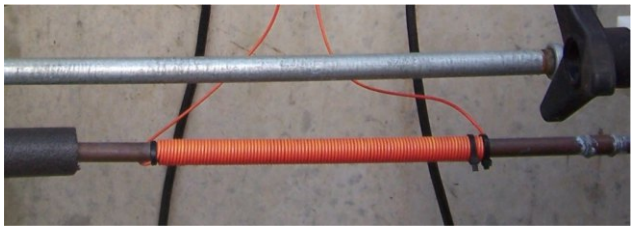
Yes, provided the carbonate hardness is significant and scaling is occurring. The removal of carbonates will lead to the removal of manganese.

- If I Install My Unit Outdoors, What Are The Coldest And Hottest Temperatures The Unit Will Be Able To Function In?

Our recommended air temperature to operate **ScaleBlaster** in is between 32-122 degree F. This does not mean the unit cannot handle temperatures under that reading or above that, but the average annual temperature the unit is installed at should be in that range.

- How Long Does The Signal Cable Last Outdoors?

On residential models, our signal cable uses a special UL approved 1015 tinned copper wire for better conductivity and a stronger signal than normal 18-gauge wire would. This wire is rated for 600 volts, double a normal wire. It is not readily available in local hardware stores, **ScaleBlaster** does sell replacement signal cable wire packs on its website. It should last many, many years with no problem. If the wire is installed outdoors and in direct sunlight or subject to extreme weather conditions like rain and snow, you may elect to cover it up with some kind of tape.



In commercial and industrial applications, the wire is normally of a thicker gauge.

- Will A Protective Cover Over The Signal Cable Hurt The Signal In Anyway?

No, not as long as it is non-magnetic.

- Can I Touch The Signal Cable When The Unit Is Turned On?

Yes, you can certainly touch the cable at any time. There is no issues of getting shocked in any way.

ScaleBlaster is a unique product in a unique industry. This section will look into the history of our technology, the “do's and don'ts” and much more.

- Will The Residential, Commercial And Industrial Units Work On 115 Or 230 VAC?

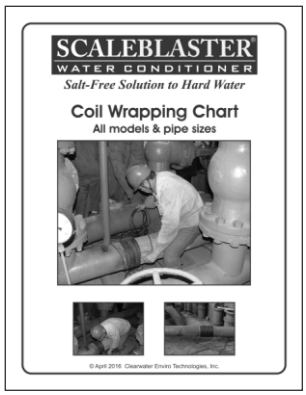
Our units are most unique – **(except for the SB-75 & SB-ICE50)** all of our units – residential, commercial and industrial will work on 115 VAC or 230 VAC automatically.

There are no adjustments to make, except on 230 VAC, you will need to replace the 115 VAC plug with a 230 VAC plug. The industrial models (**SB-1200** and up) do not come with a plug, so one will need to be added. You can replace the plug on the residential (**SB-Elite and SB-MAX Pro**) and commercial models (**SB-250**, **350**, **450**, and **650**) with a 230 VAC one and simply plug it in with no adjustments needed to the unit.

- Can You Oversize A Unit?

When sizing any unit, is it possible to oversize a unit, thinking the bigger the unit, the better the results? The answer is NO! You can never assume that by oversizing a unit with more power will always give better results. Yes, in most cases, you can oversize a unit SOMEWHAT, but there are limits. All units have a minimum pipe size that it will work on and a maximum pipe size. If you undersize the unit, it will not perform, and if you oversize a unit, the inductance of the coil will be too low and again, it will not perform. In most cases, in commercial and industrial applications, you can oversize by one pipe size. For example, if you have 2” pipe, the book generally calls for the **SB-250**. You can oversize this up to the **SB-350**.

ScaleBlaster has a 12-page manual that shows every model we manufacture and the pipe sizes and types that the unit will work on. For example, the **SB-650** will work on copper pipe from 4” to 6”, on pvc pipe from 4” to 8”, magnetic pipe 1” to 1 ½” on a one shot basis, and magnetic pipe 1 ½” to 2” pipe on recirculating pipe. Always consult with our engineers, or the Coil Wrapping Chart booklet (CLM-588).



- Do All Units Have The Same Number Of Wraps?

The answer is NO. In fact, they are all different. Magnetic pipe vs. nonmagnetic pipe and pipe size all have their characteristics corresponding to the model number you want to install. There are literally hundreds of combinations of wrap sizes for all the models, the different types of pipes, and the sizes of pipes.

- Will Magnetic Field Strength Interfere With Anything?

It will not interfere with a computer, your hard drive, Wi-Fi, or anything electronic unless you set an AM radio within a few inches of it. Though no testing has ever been done, those on pacemakers should stay at least 5 feet from the signal to be safe.

- How Far Out Is The Magnetic Field From The Coils?

Depending on the strength, usually the field is within 5 feet of the signal.

- What Associations Is Clearwater Enviro / ScaleBlaster Members Of Or Certified By?

Association of Independent Manufacturers' Representatives, Inc.

- Emerging Technology

As with any emerging technology there is always controversy. Human and corporate nature fundamentally opposes change. Fortunately, there are those who embrace change and tirelessly effort toward discovery and development of new technology. Through this effort and risk, new and exciting opportunities often evolve offering benefits for industry and consumers alike. We believe that the use of electrical and sound energy in the water improvement industry qualities as one of these.

- Controversy

The use of catalytic and magnetic devices in the treatment of water is controversial. Unfortunately, however, the predictable, as with any new and relatively inexpensive technology there are those who ride the profit wagon. These entities often make false product claims and never cease to amaze us with their creativity and devotion to generate sales. No industry or product is insulated from this phenomenon. Throughout its history, the water improvement has certainly fallen prey to wild marketing tactics and false promises, including the manufacturing, marketing and the sales of water treatment devices.

There have been many products on the market over the past 30+ years (especially magnets) which have failed to produce as advertised, thus the controversy.

- ScaleBlaster Marketing Principles

Responsible Marketing

Clearwater Enviro Technologies, Inc., the manufacturers of **ScaleBlaster**, is committed to faithfully serving our customers with innovative and cost effective product that improve water or enhances the way water works. Additionally, we strongly support responsible manufacturing and marketing practices.

Over the past 20+ years or so, we have seen at least a hundred competitors come and go. We have seen (and still see) companies that market their device as a "salt-free water softener" and other wild claims. Another company claims they have sold "hundreds of thousands" of units, yet still use a typewriter for producing their marketing literature, and have the look of doing all their marketing and production of units out of a house! These statements are false, and leave a black eye on the industry as a whole.

Marketing Materials - Refer To Marketing Materials CLM-410

C. - Water Softening, Chemicals and HVAC

- Water Softening

Water softening is the reduction of the concentration of calcium, magnesium, and certain other metal cations in hard water. These "hardness ions" can cause a variety of undesired effects including interfering with the action of soaps, the build up of limescale, which can foul plumbing, and galvanic corrosion. Conventional water-softening appliances intended for household use depend on an ion-exchange resin in which hardness ions are exchanged for sodium ions.

- Methods For Water Softening

Water softening methods mainly rely on the removal of Ca^{2+} and Mg^{2+} from a solution *or* the sequestration of these ions, i.e. binding them to a molecule that removes their ability to form scale or interfere with detergents. Removal is achieved by ion exchange and by precipitation methods. Sequestration entails the addition of chemical compounds called sequestration (or chelating) agents. Since Ca^{2+} and Mg^{2+} exist as nonvolatile salts, they can be removed by distilling the water, but distillation is too expensive in most cases (rainwater is soft because it is, in effect, distilled)

- Ion-exchange Resin Devices

Ion-exchange materials contain sodium ions (Na^{+}) that are electrostatically bound and that readily are replaced by hardness ions such as Ca^{2+} and Mg^{2+}. Ion exchange resins are organic polymers containing anionic functional groups to which the Na^{+} is bound. Minerals called zeolites also exhibit ion-exchange properties; these minerals are widely used in laundry detergents.

How It Works

The water to be treated passes through a bed of the resin. Negatively-charged resins absorb and bind metal ions, which are positively charged ($2RNa(s)+M^{2+}(aq)=R_2M(s)+2Na^{+}(aq)(M=Mg/Ca)$). The resins initially contain univalent (1+) ions, most commonly sodium, but sometimes also hydrogen (H^{+}) or potassium (K^{+}). Divalent calcium and magnesium ions in the water replace these univalent ions, which are released into the water. The "harder" the water, the more hydrogen, sodium or potassium ions are released from the resin and into the water.

Resins are also available to remove carbonate, bi-carbonate and sulphate ions which are absorbed and hydroxyl ions released from the resin. Both types of resin may be provided in a single water softener. This method is called ion exchange method.

- Regeneration

The resin's capacity is gradually exhausted and eventually it contains only divalent ions, Mg^{2+} and Ca^{2+} for cation exchange resins, and SO_4^{2-} for anion exchange resins. At this stage, the resin must be regenerated. If a cationic resin is used (to remove calcium and magnesium ions) then regeneration is usually effected by passing a concentrated brine, usually of sodium chloride or potassium chloride, or hydrochloric acid solution through them. For anionic resins, regeneration typically uses a solution of sodium hydroxide (lye) or potassium hydroxide. The salts used for regeneration are released into the soil or sewer. In industrial scale water softening plants, the effluent flow from re-generation process can precipitate scale that can interfere with sewerage systems.

- Lime softening

Lime softening, also known as Clark's process, is a type of water treatment used for water softening. In the USA, it is used primarily in the Midwest, Florida and Texas. It utilizes the addition of lime (calcium hydroxide) to remove hardness (calcium and magnesium) ions by precipitation. The process is also effective at removing a variety of microorganisms and dissolved organic matter.

History
Lime softening was first used in 1841 to treat Thames River water. The process expanded in use as the bactericidal effect of the process was discovered. Lime softening greatly expanded in use during the early 1900s as industrial water use expanded. Lime softening provides water that can, in some cases, be used more effectively for heat transfer and various other industrial uses.

Chemistry
Softening can be achieved by adding lime in the form of $Ca(OH)_2$, which reacts first with CO_2 to form calcium carbonate precipitate, reacts next with multivalent cations to remove carbonate hardness, then reacts with anions to replace the non-carbonate hardness due to multivalent cations with non-carbonate hardness due to calcium. The process requires recarbonation through the addition of carbon dioxide to lower the pH which is raised during the initial softening process.

As lime is added to raw water, the pH is raised and the equilibrium of carbonate species in the water is shifted. Dissolved carbon dioxide (CO_2) is changed in to bicarbonate (HCO_3^-) and then carbonate (CO_3^{2-}). This action causes calcium carbonate to precipitate due to exceeding the solubility product. Additionally, magnesium can be precipitated as magnesium hydroxide in a double displacement reaction.

The process is unique in that both the calcium (and to an extent magnesium) in the raw water as well as the calcium added with the lime are both precipitated. This is in contrast to ion exchange softening where sodium is exchanged for calcium and magnesium ions. In lime softening, there is a substantial reduction in total dissolved solids (TDS). In ion exchange softening (sometimes referred to as zeolite softening), there is no significant change in the level of TDS.

Lime softening can be used to remove iron, manganese, radium and arsenic from water.

Future Uses
While lime softening continues to be used at existing facilities, newer treatment plants often use membrane softening such as nanofiltration or reverse osmosis. These processes remove calcium and magnesium ions as well as other dissolved components by way of passage through a semipermeable membrane. Membrane processes generally produce a larger volume of waste — up to 20% of the input stream, but use substantially fewer chemicals and produce little, if any, solid waste.

Interestingly, lime softening is now often combined with newer membrane processes to reduce waste streams. Lime softening can be applied to the concentrate (or reject stream) of membrane processes, thereby providing a stream of substantially reduced hardness (and thus TDS), that may be used in the finished stream. Also, in cases with very hard source water (often the case in Midwestern ethanol production plants), lime softening can be used to pre-treat the membrane feed water.

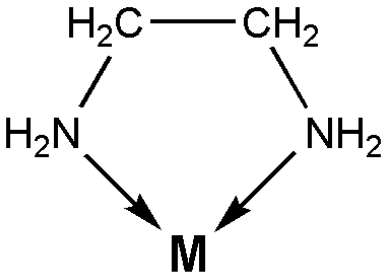
Waste Products
Lime softening produces large volumes of calcium carbonate and magnesium hydroxide sludge. This residual stream can substantially increase costs associated with the process. The sludge can be used as an agricultural soil amendment (it is an alkalinity supplement) and can also be used as a filler material in certain cementitious materials such as low strength concrete.

- Chelating Agents
Chelation is the formation or presence of two or more separate coordinate bonds between a polydentate (multiple bonded) ligand and a single central atom. Usually these ligands are organic compounds, and are called chelants, chelators, chelating agents, or sequestering agents.

The ligand forms a **chelate complex** with the substrate. Chelate complexes are contrasted with coordination complexes composed of monodentate ligands, which form only one bond with the central atom. Chelants, according to ASTM-A-380, are "chemicals that form soluble, complex molecules with certain metal ions, inactivating the ions so that they cannot normally react with other elements or ions to produce precipitates or scale."

The Chelate Effect

Chelators are used in chemical analysis, as water softeners, and are ingredients in many commercial products such as shampoos and food preservatives. Citric acid is used to soften water in soaps and laundry detergents. A commonly used synthetic chelator is EDTA.



- Health Effects From Water Softeners

Effects Of Sodium

For people on a low-sodium diet, the increase in sodium levels (for systems releasing sodium) in the water can be significant, especially when treating very hard water. For example:

A person who drinks two litres (2L) of softened, extremely hard water (assume 30 gpg) will consume about 480 mg more sodium (2L x 30 gpg x 8 mg/L/gpg = 480 mg), than if unsoftened water is consumed.

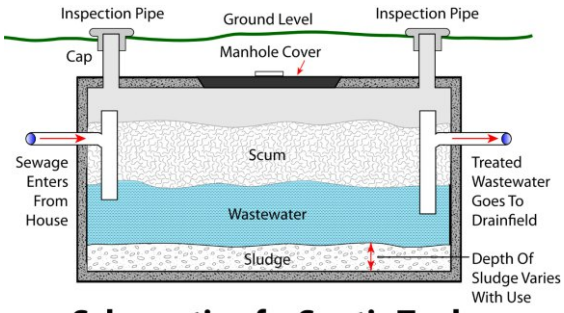
This amount is significant, The American Heart Association (AHA) suggests that the three percent of the population who must follow a severe, salt-restricted diet should not consume more than 400 mg of sodium a day. AHA suggests that no more than ten percent of this sodium intake should come from water. The EPA's draft guideline of 20 mg/L for water protects people who are most susceptible. Most people who are concerned with the added sodium in the water generally have one tap in the house that bypasses the softener, or have a reverse osmosis unit installed for the drinking water and cooking water, which was designed for desalinisation of sea water. Potassium chloride can also be used instead of sodium chloride, which would have the added benefit of helping to lower blood pressure, although costly. However, elevated potassium levels are dangerous for people with impaired kidney function: it can lead to complications such as cardiac arrhythmia.

Effects Of Soap In Hard Water

Hard water contains calcium and magnesium ions. Water softeners remove those ions by exchanging them for sodium or potassium ions. The slippery feeling experienced when using soap with soft water occurs because soaps tend to bind to fats in the surface layers of skin, making soap molecules difficult to remove by simple dilution. In contrast, in hard-water areas the rinse water contains calcium and/or magnesium ions which form insoluble stearates (or their equivalents), effectively removing the residual soap from the skin but potentially leaving a surface coating of insoluble stearates which may be seen as scum.

- Water Softeners And Septic Tanks

Water softeners are not recommended for houses with septic tanks. Water softener backwash poses a serious problem. They release sodium that kills the “good bacteria” that is needed to break down the waste. The salt can also corrode the tank and the pipes. The septic tank discharges solids into the drain field, which can cause the soil to plug and the drain field to fail. What basically occurs is the saltwater dives to the bottom of the tank and the fresh water rides across the surface of the brine layer. The heavy saltwater can actually lift the sludge from the bottom of tank, washing it into the downstream components. Septic tanks that receive water softener brine have been observed to have no distinct layers of sludge, scum and clear zone as they should in order to perform primary treatment.

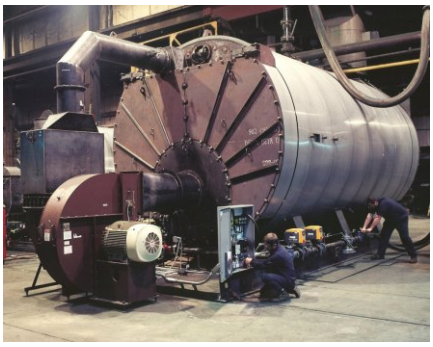


Schematic of a Septic Tank

High concentrations of salt will inhibit the growth of microorganism used for wastewater treatment. A field study of 18 wastewater treatment systems in Virginia clearly showed that nitrogen removal was inhibited in systems receiving water softener backwash brine.

Many states have instituted bans from dealers selling water softeners to customers with septic tanks including California, Connecticut, Texas, Kentucky, Massachusetts, Michigan and Montana.

- Boilers



The primary function of a boiler is to transfer heat from hot gases generated by the combustion of fuel into water until it becomes hot or turns to steam. The steam or hot water can then be used in building or facility processes.

Except for a small number of specialty models, boilers generally fit into one of the two common categories: fire-tube boilers and water-tube boilers. Fire-tube boilers pass hot combustion gases through tubes submerged in water. Water-tube boilers, on the other hand, circulate water inside the tubes in a closed vessel filled with hot combustions gases. In either category the boiler feed water and fuel often contain impurities, which impairs boiler operation and efficiency. Chemical additives can be used to correct the problems caused by these impurities. To improve feed water quality, fuel oil condition, and steam purity, these chemicals can be injected directly into the feed water, steam or fuel oil.

This fact sheet discusses the potential problems associated with the impurities in the feed water and fuel and the chemical treatment programs available.

- Benefits Of Chemical Treatments

- Increase boiler efficiency
- Reduce fuel, operating and maintenance costs
- Minimize maintenance and downtime
- Protect equipment from corrosion and extend equipment lifetime.

- Chemical Treatments For Waterside Of Boiler Tubes

The feed water is composed of makeup water (usually city water from outside boiler room/ process) and condensate (condensed steam returning to the boiler). The feed water normally contains impurities, which can cause deposits and other related problems inside the boiler. Common impurities in water include alkalinity, silica, iron, dissolved oxygen and calcium and magnesium (hardness). Blow down, a periodic or continuous water removal process, is used to limit the concentration of impurities in boiler water and to control the buildup of dissolved solid levels in the boiler. Blow down is essential in addition to chemical treatments.

- Boiler Waterside Fouling

Scale is one of the most common deposit related problems. Scale is a buildup of solid material from the reactions between the impurities in water and tube metal, on the water-side tube surface. Scale acts as an insulator that reduces heat transfer, causing a decrease in boiler efficiency and excessive fuel consumption. More serious effects are overheating of tubes and potential tube failure (equipment damage). Fuel wasted due to scale may be approximately 2-5 percent depending on the scale thickness.

- Boiler Scale And Deposits

Boiler scale is caused by impurities being precipitated out of the water directly on heat transfer surfaces or by suspended matter in water settling out on the metal and becoming hard and adherent. The evaporation in the boiler causes impurities to concentrate.

In untreated boiler water, the formation of scale is like a "back to nature" movement. As minerals are deposited out from water they form many types of crystalline and rock-like structures. The most common scale in boilers is due to carbonate deposits caused by hardness.

Carbonate scale is usually granular and sometimes very porous. A carbonate scale can be easily identified by dropping it in a solution of hydrochloric acid. Bubbles of carbon dioxide will effervesce from the scale.

Sulphates scales are harder and denser. A sulphate deposit is brittle and does not effervesce when dropped in acid. Silica scales resemble porcelain. This scale is very brittle, is not soluble in acid, and dissolves slowly in alkali.

Iron deposits are very dark colored. They are either due to corrosion or iron contamination in the water. They are soluble in hot acid giving a dark brown solution.

- Problems Caused By Scale

The biggest problem caused by scale is overheating and failure of boiler tubes. The thermal conductivity of porous boiler scale is similar to insulating brick. The scale acts as an insulating layer and prevents an efficient transfer of heat through the tubes to the circulating water. The reduction in thermal conductivity means lower boiler efficiency which in turn leads to overheating and may result in the softening, bulging or even fracturing of the boiler tubes. Boiler scale can also cause plugging or partial obstruction of circulating tubes in a water tube boiler, which again causes starvation and overheating of the tubes.

Another important aspect is that corrosion may occur under the boiler scale. In general, boiler scale causes

a. increased fuel bill by decreasing the operating efficiency
b. thermal damage
c. unscheduled down-time
d. increased cleaning time and cleaning costs
e. reduced working life of a boiler

- Corrosion

Corrosion is one of the most serious problems in boiler operation. Dissolved oxygen and carbon dioxide are the two gases which are mainly responsible for this.

What is corrosion? Stated simply, corrosion is the reversion of a metal to its ore form. Iron, for example, reverts to iron oxide as the result of corrosion.

Corrosion takes many forms, it may produce general attack over a large metal surface or it may result in pinpoint penetration of metal. Corrosion often occurs in standby boilers due to the exposure of wet metal to the oxygen in the air.

Oxygen Attack is the most common causes of corrosion inside boilers. Dissolved oxygen in feed water can become very aggressive when heated and reacts with the boiler's internal surface to form corrosive components on the metal surface. Oxygen attack can cause further damage to steam drums, mud dams, boiler headers and condensate piping.

Acid Attack is another common cause of corrosion. Acid attack happens when the pH of feed water drops below 8.5. The carbonate alkalinity in the water is converted to carbon dioxide gas (CO_2) by the heat and pressure of the boilers. CO_2 is carried over in the steam. When the steam condenses, CO_2 dissolves in water to form carbonic acid (H_2CO_3) and reduces the pH of the condensate returning to the boilers. Acid attack may also impact condensate return piping throughout the facility.

- Boiler Water Treatment

Lime Softening And Soda Ash

Quick or slaked lime (usually calcium hydroxide) is added to hard water to precipitate the calcium, magnesium and, to some extent, the silica in the water. Soda ash is added to precipitate non-bicarbonate hardness. The process typically takes place in a clarifier followed by a hydrogen cycle cation exchange and a hydroxide cycle anion exchange demineralization. Please see the basic boiler system schematic illustrated on the next page.

Phosphate

Mono-, di- or trisodium phosphate and sodium polyphosphate can be added to treat boiler feed water. Phosphate buffers the water to minimize pH fluctuation. It also precipitates calcium or magnesium into a soft deposit rather than a hard scale. Additionally, it helps to promote the protective layer on boiler metal surfaces. However, phosphate forms sludge as it reacts with hardness; blow down or other procedures should be established to remove the sludge during a routine boiler shutdown.

Chelates
Nitrilo triacetic acid (NTA) and ethylene diamine tetra acetic acid (EDTA) are the most commonly used chelates. Chelates combine with hardness in water to form soluble compounds. The compounds can then be eliminated by blow down. The preferred feed location for chelates is downstream of the feed water pump. A stainless steel injection quill is required. However, chelates treatment is not recommended for feed water with high hardness concentration.

Polymers
Most polymers used in feed water treatment are synthetic. They act like chelates but are not as effective. Some polymers are effective in controlling hardness deposits, while others are helpful in controlling iron deposits. Polymers are often combined with chelates for the most effective treatment.

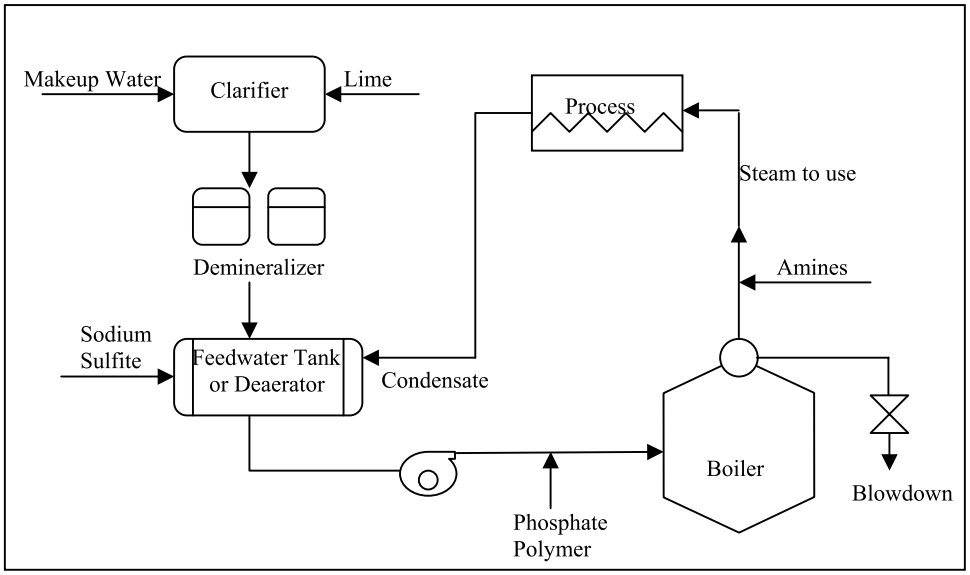
Oxygen Scavengers
A deaerator removes most of the oxygen in feed water; however, trace amounts are still present and can cause corrosion-related problems. Oxygen scavengers are added to the feed water, preferably in the storage tank of the feed water, to remove the trace amount of oxygen escaped from the deaerator. The most commonly used oxygen scavenger is sodium sulfite. Sodium sulfite is cheap, effective and can be easily measured in water.

Neutralizing Amines
Neutralizing amines are high pH chemicals that can be fed directly to the feed water or the steam header to neutralize the carbonic acid formed in the condensate (acid attack). The three most commonly used neutralizing amines are morpholine, diethyleminoethanal (DEAE) and cyclohexylamine. Neutralizing amines cannot protect against oxygen attack; however, it helps keep oxygen less reactive by maintaining an alkaline pH.

Filming Amines
Filming amines are various chemicals that form a protective layer on the condensate piping to protect it from both oxygen and acid attack. The filming amines should be continuously fed into the steam header with an injection quill based on steam flow. The two most common filming amines are octadecylamine (ODA) and ethoxylated soya amine (ESA). Combining neutralizing and filming amine is a successful alternative to protect against both acid and oxygen attack.

The basic boiler system schematic shown below illustrates the points of chemical addition for boiler water treatment:

Basic Boiler System Schematic



List Of Problems Caused By Impurities In Water

Impurity (Chemical Formula)	Problems	Common Chemical Treatment Methods
Alkalinity (HCO_3-, CO_3^{2-} and $CaCO_3$)	Carryover of feedwater into steam, produce CO_2 in steam leading to formation of carbonic acid (acid attack)	Neutralizing amines, filming amines, combination of both, and lime-soda.
Hardness (calcium and magnesium salts, $CaCO_3$)	Primary source of scale in heat exchange equipment	Lime softening, phosphate, chelates and polymers
Iron (Fe^{3+} and Fe^{2+})	Causes boiler and water line deposits	Phosphate, chelates and polymers
Oxygen (O_2)	Corrosion of water lines, boiler, return lines, heat exchanger equipments, etc. (oxygen attack)	Oxygen scavengers, filming amines and deaeration
pH	Corrosion occurs when pH drops below 8.5	pH can be lowered by addition of acids and increased by addition of alkalies
Hydrogen Sulfide (H_2S)	Corrosion	Chlorination
Silica (SiO_2)	Scale in boilers and cooling water systems	Lime softening

- The Basics Of Cooling Tower Water Treatment

The purpose of a cooling tower is to remove the heat generated by an HVAC system (cooling of compressor refrigerant and heat generated by the compressor itself). Cooling is accomplished through the latent heat of vaporization. For each pound (.121 gallons) of water that a cooling tower evaporates, it removes about 1,000 BTU's from the liquid that remains. As evaporation increases more heat is removed. Water vapor evaporates, leaving dissolved or suspended solids in the re-circulating cooling water. As evaporation increases, the re-circulating water becomes more concentrated with solids. A variety of microorganisms, gases, nutrients and dust are scrubbed from the atmosphere during the evaporation process adding additional contaminants to the re-circulating water.

Cycles Of Concentration

The term “Cycles of Concentration” refers to the concentration of solids in the re-circulating water as compared to the makeup water. Cycles of Concentration can refer to a variety of components, but the industry accepted standard for measuring “Cycles” is a comparison of the chloride content in the sump water versus the makeup water.

Cooling Tower Water Treatment

Water Treatment becomes critical as the “contaminated” water re-circulates through the chiller tubes. Biological contaminants and certain inorganic substances are “drawn” to the heat transfer surfaces. Left unchecked they coat and insulate the heat transfer surfaces inhibiting the effective transfer of heat, corroding chiller surfaces, and eventually reducing flow through the chiller. Scale, Biofilm, Corrosion & Bacteria are the four most common concerns associated with operation of evaporative cooling systems.

Scale

When makeup water contains high concentrations of inorganic salts, mineral scale can form insulating deposits on heat exchange equipment. When deposition of these salts is heavy, heat transfer and water flow may be severely restricted. The resulting rise in condensing temperature will cause a reduction in refrigeration capacity and an increase in energy consumption. Calcium is particularly problematic as it precipitates from solution at warmer temperatures and in the presence of carbonate alkalinity will readily convert to calcium carbonate scale. Acids and organic polymers are commonly used to prevent and remove scale deposits. The use of acids must be carefully managed as acidic conditions can result in corrosion and the premature degradation of equipment.

Biofilm

The cooling water system creates a number of ecological niches for colonization by microorganisms. Biological deposits on metal surfaces are powerful heat insulators. Biofilms have 6 times more insulating capacity than scale and can also contribute to corrosion. Biofilms vary in composition; some are more resistant than others to traditional chemical biocidal programs such as chlorine or bromine. Ozone Gas and Chlorine Dioxide Gas have proven to be most effective in the eradication of both biofilms and bacteria in cooling water.

Corrosion

Corrosion results primarily from the use of corrosive or acidic chemical additives, acid producing microorganisms residing in biofilms, and "White Rust" (see below). Often the chemicals used to control bacteria, scaling and biofilm, contribute to chemically induced corrosion. Microbiologically Influenced Corrosion (MIC) is a result of destructive microorganisms that produce sulfuric acid, hydrogen sulfide, or other corrosive materials that can corrode metal. Once established, MIC can be difficult to eliminate. Preventing the occurrence of MIC is an important consideration in any water treatment program.

Bacteria

Deadly Legionella bacteria has been a recurring problem in cooling towers and evaporative condensers for decades. Warm water temperatures and the presence of other biological matter and organic debris promote the growth of Legionella bacteria. Many protocols call for alternating biocides to insure that bacteria present in the system do not become resistant to any one compound. Legionella can be difficult to kill because the bacteria can tolerate relatively high levels of chlorine or bromine, the two most commonly used chemicals in cooling tower water treatment. Ozone and Chlorine Dioxide gasses are both highly effective treatments for Legionella, but are not widely used due to the cost and technical expertise required to properly administer the program and maintain the equipment required to generate the gasses onsite. Programs in which the gas is generated on demand based on sump water quality are most effective, and have less downstream environmental implications than chlorine or bromine based programs.

White Rust

White Rust is a serious problem primarily found in newer galvanized steel cooling towers and related components. The problem stems from improper start-up procedures, or failure to properly passivate a new cooling tower. The condition is aggravated by high alkalinity (high pH) and softened water. The three largest cooling tower manufacturers in the US each offer a specific passivation protocol. The protocols vary slightly, but each calls for the use of inorganic phosphates, initial pH control between 6.5-8.0 and control of the heat load during the passivation phase.

D. Residential ScaleBlaster

ScaleBlaster has three (3) premium residential models – the **SB-75**, **SB-Elite** and the **SB-MAX Pro**. The **SB-75** and **SB-Elite** come with 3-year warranties while the **SB -MAX** comes with a 10-year warranty. Extended warranties are available online on the **SB-75** and **SB-Elite** models. All units come with a 90-day money back satisfaction guarantee.

SB-75

SB-Elite

SB-MAX Pro

Tankless water heater scaling up and shutting down only to require flushing out of the lime scale deposits? Water heating elements needing continuous replacement? Dishwasher or washing machine breaking down due to hard water?

Soap that won't lather well? Bad hair days? Lime scale deposits on faucets, sinks and other plumbing fixtures? Mold and mildew on shower curtains? Shortage of hot water? Poor water pressure? Bad tasting water? Water heater breaking down again? High water heating bills? Using a lot of soap and detergents to get the job done? Towels and clothing wearing out?

If this sounds like what you are experiencing, chances are you live in a hard water area.

Unless you have invested in an expensive, maintenance prone and environmentally damaging water softener, you have taken your water for granted.

- ScaleBlaster Benefits

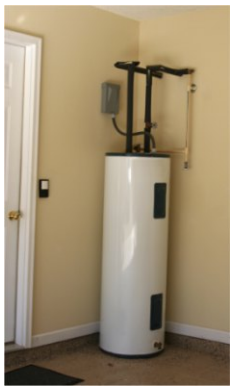
- *Helps protect the life of water heaters, dishwashers and washing machines*
- *Removes scale buildup in tankless water heaters permanently without filters or maintenance*
- *Removes all lime scale deposits that have built up in your household pipes*
- *Dishwasher, washing machine and other water fed appliances will operate more efficiently*

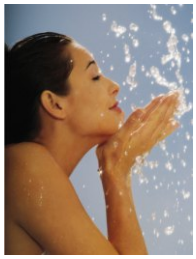



- *May improve symptoms of eczema without the need of special creams*
- *Water heating bill will go down dramatically*
- *Water will taste better because pipelines have been cleaned out of scale deposits*
- *Skin will feel smooth and hair will be much more manageable*
- *Stains on sinks, basins, toilets will be easily wiped away*
- *Less scum will allow for soap and detergents to work more effectively*
- *Water heater will work much more efficiently*
- *Premature failure of water heater and heating elements are no longer a problem*
- *With scale removed, there is a less likelihood for bacteria, making your water healthier*
- *Coffee will taste better, and juices & concentrates will be much more flavorful*
- *Shower heads will no longer clog up with lime scale*



- *Water filters and RO membranes will work more efficiently*
- *Scale deposits in pipes are a breeding ground for bacteria*
- *Lime scale deposits will never form again once removed*
- *Water will feel "softer", and soap will lather up much more*
- *Soap and detergent use can be cut back by 25% or more*



- Best Of All...

- You are protecting our environment by not treating your water with a water softener
- You are investing in your health by keeping calcium and magnesium in your water - instead of salt
- Your investment will never require maintenance, salt, or filters to change
- **ScaleBlaster** costs less than a water softener and all of the salt and maintenance they require



- The HEALTHY Alternative

According to the World Health Organization, there is a direct correlation between softened water and an increase in heart disease primarily because softeners remove beneficial calcium from the water and replace it with unhealthy sodium. Calcium and magnesium are naturally present in our water supply and are beneficial minerals required by our metabolism. Why remove them?

High blood pressure directly increases the risk of coronary heart disease and stroke, and heavy sodium can cause high blood pressure. As a result, patients are often placed on sodium restricted diets. Since traditional water softeners add sodium to the water, it is important to take the steps necessary to ensure that your business is providing a healthy alternative.

Much of today's drinking water has twice the EPA limit for sodium content. In the end, humans consume from two to ten times the amount of salt needed for a healthy existence.

According to the National Agricultural Safety Database (NASD), soft water is more likely to dissolve certain metals from pipes than hard water. These metals include cadmium and lead, which are potentially toxic.

ScaleBlaster water will taste better and will feel “softer” while showering or bathing.

Water softeners exchange beneficial minerals in your water for sodium. ScaleBlaster provides a healthy alternative to water softeners.

- How Can You Tell If The Unit Is Working?

We get this question often. Since we don't remove calcium from the water, it is not easy to convince skeptics if the unit is working or not. For residential models, there are a few ways you can tell it is working, or was installed correctly:

One way is by taking an old portable AM radio and tuning it to a frequency where no noise is coming out of the radio. Place the radio next to the signal coil with the **ScaleBlaster** unit on. It should make a distinct noise like a “locomotive” coming. It has a distinct sound that overtakes the radio and gets louder the closer you bring the radio to the signal cable.

It is not a very scientific way to test something, but it gets the job done. If you disconnect the signal cable, the sound will stop instantly.

- Check On The Aerators

Before the **ScaleBlaster** is installed, check the showerhead holes and faucet aerators. Then after the installation (perhaps a week or two later), check the aerators again. It may actually get worse. This means the scale in the pipes is cleaning out and the unit is working!

- What If The Customer Claims The Unit Is Not Working?

What happens if a customer claims the unit is not working? There are several steps that can be taken:

Find Out What The Problem Is

The first step that needs to be taken is finding out what the customer has an issue with. He may have had a water softener all his life and was hoping **ScaleBlaster** will give you the same feeling (it won't). He may be complaining that his aerators are clogging up now (this may be normal during the initial phase of the unit descaling the pipes). After years of use, he may be getting some spotting on his glasses in the dishwasher (phosphates were banned in July of 2010 as an ingredient in dishwasher soap detergents).

You will need to know what his concerns or problems are, and then overcome them. Later in this section, we will go more into detail on how to solve and overcome some of these issues and more.

Has The Correct Model Been Installed? How Hard Was The Water?

Make sure the correct model has been installed. The size of the pipe and the model must be correctly matched. There are 13 models now available to fit any size pipe from ¼" to 40". A unit undersized would not be able to do the job properly and an oversized unit may send too much of a signal that simply overpowers itself and gets in the way of its own signal.

An undersized unit installed on a water hardness level that exceeds what is recommended will lead to failure. For example, if you have very hard water and don't know the actual hardness level (without using a calcium hardness test kit) you may be under-sizing a unit. This may be especially true for those on well water.

SB-75

SB-Elite

SB-MAX Pro

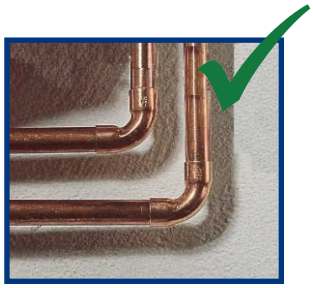
In summary, if you have very hard water, it is best to go with the **SB-MAX Pro** model.

WE STRONGLY RECOMMEND THAT YOU TEST THE WATER HARDNESS LEVELS BEFORE EVERY INSTALL. A READING NEXT DOOR MAY BE RADICALLY DIFFERENT.

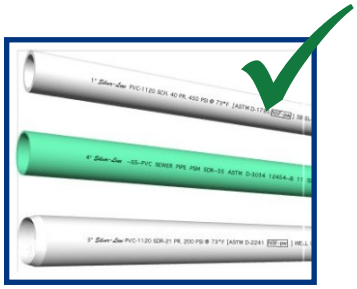
While our water hardness map (see page 4) is nice to have, it will only give you a general idea of what it is in the general area of the state or country. Again, well water would most likely be harder water than noted on the maps.

Check The Type Of Pipe The Unit Was Installed On

Make sure the pipe type is copper, pvc, or pex. If the unit was installed on galvanized pipe, or has magnetic characteristics (where a magnet will stick to the pipe), the unit will not work. You will need to replace that section of pipe with copper or pvc pipe. **See section E for more details.** Pages 52-60



Copper Pipe



PVC, CPVC & PEX Pipe

Galvanized Steel Pipe

Check The Installation For Proper LED Readout

Besides making sure the proper model was installed, the installation should be checked out properly. Make sure the LED light is working correctly – **see LED light section in chapter E** (page 60).

Check The Number Of Coil Wrappings

The number one problem is that the customer has an incorrect number of coil wrappings. A special note is included in the signal cable package not to over wrap the wire. Some people see all the extra wire in the package, and use it all up, thinking more is better. This is not the case. The impedance of the signal is altered with the extra wrappings, and the signal is actually doing nothing.

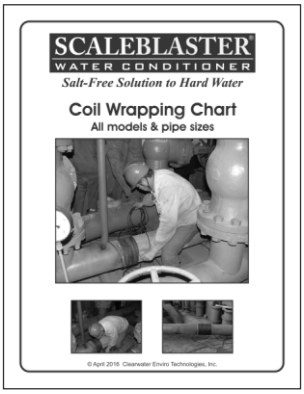
57 wraps
correct # of wraps

vs.

110 wraps
all wire in pack used
- too much -

All models have their own special number of wrappings based on the size of the pipe and the type of the pipe. These numbers have been determined after thousands of hours of testing by our engineers over the past decade and a half. The optimum signal strength is obtained on the number we have recommended.

ScaleBlaster has a 12-page manual that shows every model we manufacture and the pipe sizes and types that the unit will work on. For example, the SB-650 will work on copper pipe from 4” to 6”, on pvc pipe from 4” to 8”, magnetic pipe 1” to 1 ½” on a one shot basis, and magnetic pipe 1 ½” to 2” pipe on recirculating pipe. Always consult with our engineers, or the Coil Wrapping Chart booklet (CLM-588).



Check The Location Of The Coil Wrappings

The exact location of the coil wrappings is imperative for the unit's success.

You need to make sure the coil wrappings are on the correct pipe - on the incoming cold water line. You also need to make sure there is no outside interference, like a motor or A/C unit nearby.

Electric motor

A/C unit

For best results, you need to wrap the signal cable on a straight section of pipe of 12” or more. Keep the signal cable as far away from tees, elbows, couplings, valves and any curved pipe.

See Chapter E - ScaleBlaster Residential Installations (Pages 52-60) For Complete Details.

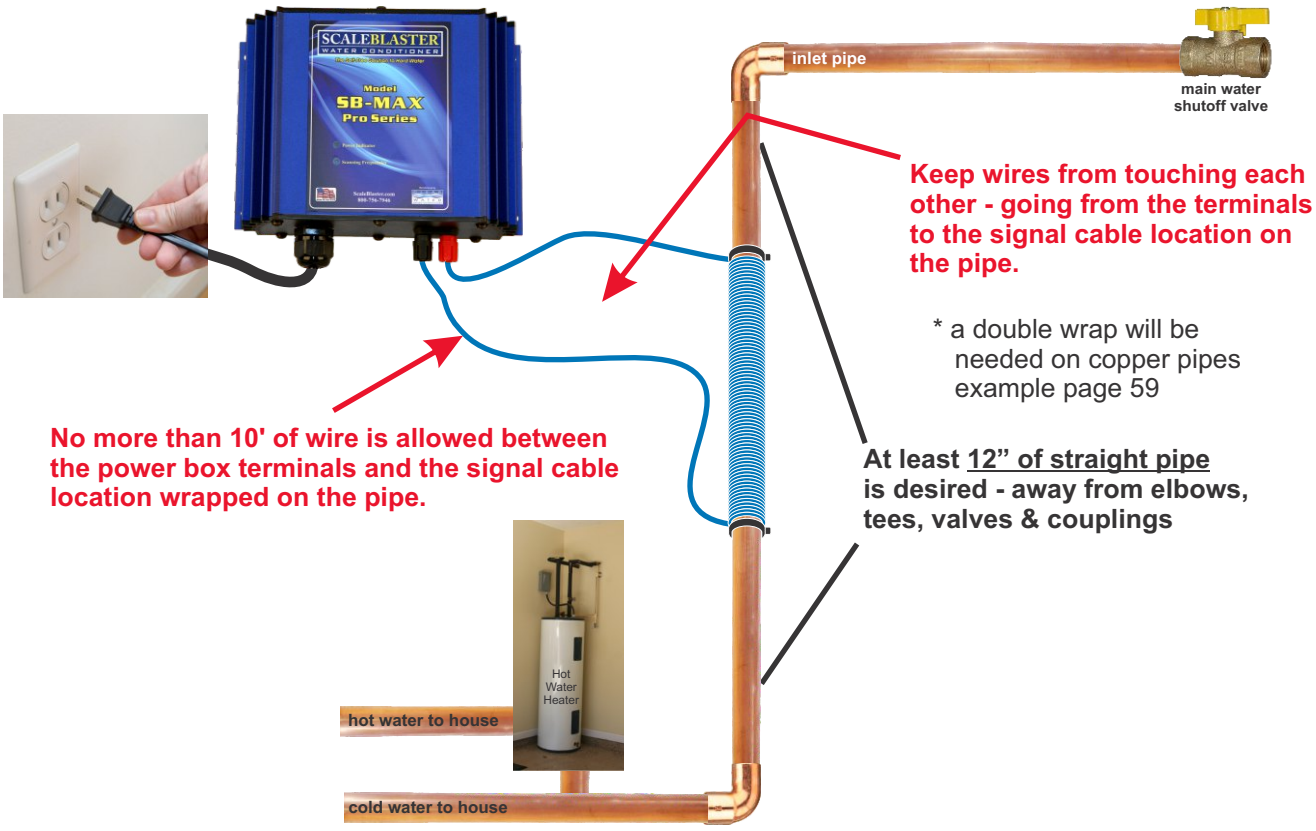
Check The Actual Wrapping Itself

Make sure the coil wrappings are flush against one another, wrapped tightly and not overlapping. There cannot be any gaps or loose wire wrappings. The pipe must be straight without any change in diameter or restrictions on where the coil is being wrapped. Make sure if the wrapping is on copper pipe that the wrapping was double wrapped (recommended, but not required). The wrapping needs to go in one direction – and if double wrapped, this is VERY IMPORTANT! (See page 59)

*** All wraps should be either clockwise or counter-clockwise... never both!**

Check The Wire From The Control Box To The Pipe

Make sure the wiring from the power box to the pipe is not touching each other and is no longer than 10 feet long in each direction. In other words, the wiring coming out of the power box should not touch the other wiring (it can be close to each other, but we prefer not touching each other) coming back from the signal cable wrapping. This wiring should not extend more than 10' from the power box terminal to the actual pipe getting wrapped, and another 10' of wire going back to the control box terminal.



Unplug The Unit For A Few Days

The best way to help the customer determine if the unit is working or not, is to simply unplug the unit for a few days. This can help him determine if he notices a difference at this point. He may come back and say "You're right; I did notice the difference when it was plugged in vs. it not plugged in."

- If All The Above Is Checked Out And The Customer Is Still Unhappy, What Can I Do Next?

If you have a unit that is not satisfying the customer, there are a couple of things you can do.

Simply upgrading the unit to a more powerful unit will solve 95% of the issues. Clearwater Enviro has a special upgrading arrangement we can work with the customer or dealer. For example, we will upgrade an **SB-75** to an **SB-Elite** or **SB-MAX Pro** and this will usually solve the problem.

If the customer is still unhappy, and all the above procedures have been taken, you may have to refund the money. We do give a customer a 90-day trial or their money back.

The number one reason for the return is that they most likely had a water softener before, and are not satisfied with the results. Remember, **ScaleBlaster** is not a water softener. There still may be some spotting on dishes and the soap lather in the shower may not be as "dramatic" as a water softener. The water will not be as slippery either. Sometimes, the lady in the house loves that slippery feeling, and does not want to give it up.

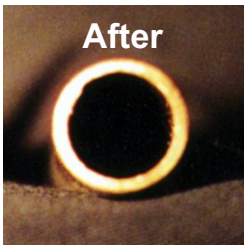
The number two reason is that the water is simply too hard, where even water softeners fail to work.

- What If The Customer Installed The Unit Themselves?

While we prefer a professional install the units, we understand that cannot always be the case. If someone has a unit and they claim it is not working, the best advice would be to get a photo of the installation. Make sure the photo shows everything – the location, the pipe, the unit on the wall.

You will be able to tell a lot from the photos, and from there you can review the above listed issues of the installation. Of course, find out first what their concern really is.

- Allow Up To 90 Days For Full Effects



All residential units come with a full 90-day money back guarantee. There is a reason for this. It takes time to fully descale the pipes in the house, and to clean out the water heater.

- Determining How Long It Will Take To Descale The Pipes

How long will it take to descale the pipes in the house? This may be like predicting who will win the Super Bowl next year. You may have a good idea, but it is impossible to predict with authority. However, you can use these guidelines as an example:

Water Hardness Is A Huge Factor

Unless you crack into the pipes, you will have no idea how much scale is in the pipes. If the water hardness level is very hard, of course more scale will form inside the pipes. Less hard water will leave less scale over the same amount of time. But no matter what your hardness level is, scale will accumulate over time.

The Older The House, The More Scale You May Have

We have treated buildings in New York City that were full of scale. You may ask "New York City has the softest water in the country, how can you get scale formation there"? While NYC's water is around 1-2 gpg in most areas, over a long period of time, scale will form. By the way, those buildings we were talking about were built in the 20s and 30s, so we are looking at nearly 90 years of buildup!

Water Usage Is Key To Descaling

The amount of water being used is a critical factor in determining how long the descaling process will take. If you have a house with a little old lady living by herself, it will take a lot longer to descale the pipes, than say a household of six.

Descaling only happens when water is running through the pipes. So, the more water, the quicker the pipes will descale. It is as simple as that.

Can ScaleBlaster Be Installed With A Water Softener?

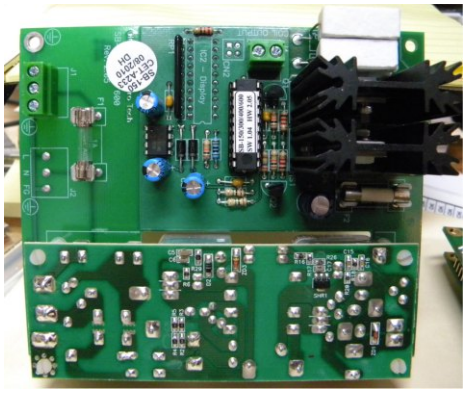
If the house has a water softener, and the customer wants to keep it, you may install the **ScaleBlaster** to work in conjunction with it.

The jury is still out on whether the **ScaleBlaster** should be installed before or after the softener. There are benefits if you install the **ScaleBlaster** before the softener. **ScaleBlaster** will not eliminate iron staining, but it will help protect the resin from being damaged due to iron. **ScaleBlaster** will protect the resin of a salt type water softener or the iron filter and will allow them to function much longer. You may be able to enjoy less regeneration and set the recycling on a lower gpg.

Is The ScaleBlaster Unit Portable?

Yes, the **ScaleBlaster** unit is portable. You can simply unplug it, unscrew the screws holding the unit on the wall, and disconnect the signal wire cable from the terminals. Our units are unique in that we are non-intrusive, we rarely cut into the pipe unless it is on galvanized pipe. You can take the unit with you, and easily install it again.

How Long Will The ScaleBlaster Unit Last?



Our units are designed to last several years, with the premium models like the **SB-MAX Pro** lasting longer. There are no moving parts and the units are designed with the latest in computer chip technology. The units do not use much electricity and do not generate much heat.

How much electricity does the unit use a year?

Our standard residential units use about 10 watts of energy – about that of a nightlight!

How does that equate in a yearly cost? This is how you figure that out:

10 watts x 24 (hours a day) = **240 watts hours in a day**

240 watts a day x 365 (days in a year) = **87,600 watts hours in a year**

87,600 watt hours a year = **87.6** kWh (kWh = kilo Watt Hour)

If your electricity is **10.6 cents per kWh** = **$8.76 a year in total electricity use**

- How Long Will It Take Till I See Results Other Than Scale Removal Inside Of Pipes?

As we mentioned earlier in this section, it does take up to 90 days to notice the full effects. Until the pipes and shower heads and faucets are fully descaled, you will not be able to fully enjoy the benefits of **ScaleBlaster.** The water heater may take some time to clean out also, but by 90 days the water pressure may have improved and the water may be a bit warmer also.

You may notice immediately (within a day or two of installation) an increase in soap suds and the hair feeling softer. This is due to the less "surface tension" in the water.

- Does Scaleblaster Affect The Taste And Smell Of Water?

We have had hundreds of customer's rave about the better tasting of the water. As we have said before, **ScaleBlaster** is not a filtration system in any way, but we do get lots of compliments. This is due to the bacteria being removed from water. How do we remove bacteria if we are not a filtration or ozone system? Simple. Bacteria forms in limescale as a breeding ground. Without the scale, the bacteria has no place to attach to. When the scale is removed, the bacteria goes with it.

- Aerators, Head Screens Clogging Up

After the product is installed, the customer needs to understand that things may actually get worse for a while! Let them know that this is normal and the unit is working.

Though most of the existing scale will dissolve molecule by molecule back into the water, there are some areas where you can notice scale accumulation in areas right after the installation.

After a period of time, scale inside the pipes, around sinks, taps and showerheads will soften. These deposits may collect inside the faucet and head screens, leading to temporary blockage. It is best to periodically clean these screens as needed during the period of scale softening.

- Spotting On Dishes

During the initial hookup of **ScaleBlaster**, spotting may increase in the dishwasher or hazy dishes coming out of the dishwasher. The main reason this may happen is if the homeowner has an old dishwasher, or if their pipes are scaled up. As descaling takes place, this process may release additional scale deposits and "evaporative mineral build-up" may occur as rapid heating takes place. This is normal. If the house or dishwasher is old, or in a very hard water area (well over 15 gpg), some steps will need to be taken to make the customer happy. Getting scale out of old dishwashers takes considerable time, and if the dishwasher is too old, it may never fully work like it did brand new.

There are two reasons why dishes would be "hazy" or spotty coming out of the dishwasher - too much soap is being used or hard water calcium deposits are being left behind. First, determine why the haziness or spotting is forming:

A. If the haze can be washed away with warm water, then the haze would clearly be from too much soap. Cut back on soap use and use one tablespoon of a product called LemiShine (a dishwasher detergent additive sold in many grocery stores) in the closed detergent slot and one tablespoon of granular Cascade Complete detergent in the open slot.

B. If the haze can be only removed by vinegar, then it is from hard water minerals in the water. This will most likely happen during the descaling process. Again, use LemiShine to reduce this spotting on dishes. You can also run the dishwasher empty on the rinse cycle and put one or two cups of vinegar in the bottom and circulate the vinegar in the rinse cycle. This should solve the problem.

- Phosphate Ban

On July 1, 2010, 16 states banned the use of phosphates in dishwasher detergents as part of the "going green" movement. Those states included Michigan, Illinois, Indiana, Maryland, Massachusetts, Minnesota, New Hampshire, Montana, Oregon, Ohio, Pennsylvania, Utah, Vermont, Virginia, Wisconsin and Washington. Manufacturers decided to change their formulations to phosphate-free in those states and the other 34 states instead of manufacturing two types of detergents.

The phosphates helped prevent spotting in glasses. On Cascade's website, phosphates were originally included in detergent formulations in order to aid in the removal of food and grease from dishes and glassware. Phosphates are powerful cleaning agents, but also harm the environment.

Remember, **ScaleBlaster** does not remove calcium from the water, so some spotting may still exist.

- Recommended Types Of Dishwasher Soap

If you can't locate Lemi Shine, Proctor & Gamble recommends using Cascade Action Pacs with Dawn or Cascade All-in-one Action Pacs for best cleaning results.

- Does Scaleblaster Affect Eczema Or People With Itchy Skin?

ScaleBlaster will help those with eczema and people with itchy skin, but because we do not have documented scientific proof, we do not "broadcast" this as a major selling point. We get compliments all the time from people about their eczema getting cured and the itchy skin disorders going away, but when you start making medical claims, you open yourselves to legal trouble. The best way to advertise this is "**ScaleBlaster** may help relieve eczema and dry skin problems". It will never "cure" eczema, as there is no known cure of it, only a cream to relieve the effects of it.

- Spotting On Other Locations

As we have mentioned in other sections, **ScaleBlaster** does not remove calcium from the water, so some spotting may occur on shower doors and faucets. This is caused by water evaporating and leaving a few spots behind. This spotting will easily wipe off, however.

- Water Heaters And ScaleBlaster

Your household water heater is one of your most valuable and important household appliances and is often overlooked or forgotten until there is a problem.

Problems can include cracking and popping due to a lack of hot water getting produced. **ScaleBlaster** can help prevent the scale buildup that will form inside the water heater, thus reducing the efficiency and shortening the lifespan of the system.

Generally, the bottom heating element will fail due to hard water, and will need replacing on a periodic basis. As a precaution, we recommend you purge or drain your water heater when installing the **ScaleBlaster** and about 90 days after installation.

Limescale buildup will decrease heat transfer causing your water heater to be inefficient.

- Draining Your Water Heater

If you have an electric water heater - turn off the power at the breaker-box. If you have a gas heater, turn the thermostat to the “pilot” setting.

Connect a hose to the drain valve located close to the thermostat, but don't open the valve yet.

Turn off the cold-water supply that feeds the water-heater.

Inside your house, open up one of the hot-water faucets in one of your sinks or tubs. This will prevent calcium from forming in the lines.

Go back to the water-heater, and open the drain valve to drain the hot water out of the tank. For best results, open and close the valve on the drain in one minute intervals – one minute on, and one minute off. This is to enable the “shaken- up” scale to settle back down to the bottom of the heater. This will help it to flush out better when you open the valve again. This step is especially helpful in very hard water areas and those who have not drained their water heater in a while.

Once the water stops flowing out of the far end of the hose, turn the water supply back on. This will flush out any remaining sediment left behind in the heater. Once the water runs clear from the end of the hose, close the drain valve. Don't forget to turn the hot-water faucet inside your house back off.

The heating element could possibly blow if there is no water in the tank. Some tanks may need to be completely full in order to prevent damage. When in doubt, always read the warnings and instructions on the tank label carefully, because each tank may vary.

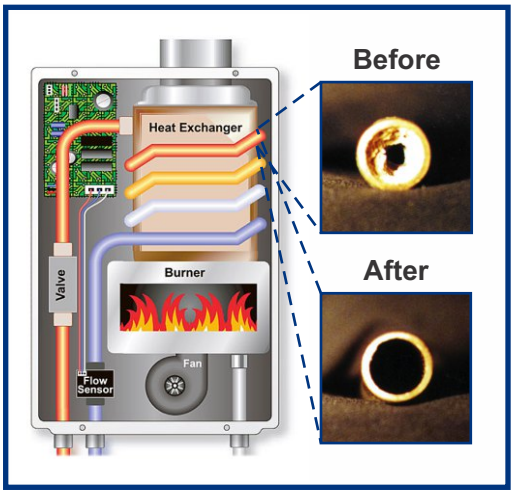
- Test The Pressure-release Valve

Turn the power supply to the water heater back on at the breaker box (or the thermostat) after the tank has been filled with water. Once the water temperature has been brought back up, test the pressure-relief valve according to the manufacture's instructions. This safety device is designed to prevent excess pressure build-up or overheating inside the tank.

- Tankless Water Heaters

A tankless water heater is also affected by hard water. In a tankless water heater, it is only heating water when the water is moving through the heat exchanger coil. As particulate drops out of suspension in the heat exchanger most of it is whisked away unnoticed. Some will bond to the interior wall of the copper tubing, but at a slower rate since it is being flushed as it is being used.

Over time, this scale buildup will result in the overheating of the heat exchanger. This will cause an error code and the tankless water heater will lock out. This means it will not operate until the unit is reset and the problem corrected. Resetting a tankless heater without solving the problem will simply make the unit lock out again. It will



protect itself. The error code flashing on the remote or computer board will help the technician figure out what is wrong so it can be fixed.

By installing **ScaleBlaster**, you can prevent scaling issues with tankless water heaters. We strongly recommend you install an **ScaleBlaster** unit on the houses incoming water supply line or just before the tankless water heater.

Most manufacturers will not honor a warranty claim if the problem was due to hard water and scaling issues.

- Alternatives To Solving Tankless Water Heater Issues

ScaleBlaster is your best, no maintenance alternative to solving scaling issues with tankless water heaters.

Besides **ScaleBlaster**, the traditional way of solving scaling issues is with a water softener. This will not dissolve existing scale and should only be installed when the tankless has been flushed or cleaned out.

There is another product on the market to keep scale from forming in tankless water heaters.

A small specialized filtration system can be installed in front of the tankless water heater to reduce scale formation. The anti-scale system will transform calcium ions into calcium crystals and are rinsed away by the water flow. The systems cost about $250 plus installation, and require the constant changing of its replacement filters at about $150. **ScaleBlaster** can duplicate this benefit and others without the changing of filters, which nobody likes to do.

- Cleaning A Tankless Water Heater

As a tankless water heater is entirely self-contained, removing limescale deposits is a special procedure. You will need the correct hoses, connectors and support equipment. For those with do-it-yourself experience, the job is fairly straightforward. If you are not experienced though, you should seek professional help.

Turn off all water valves to the unit.

Set up the hoses. Disconnect the inlet water hose by using your wrench to turn the fitting counterclockwise. Attach one of your water hoses to the inlet, turning the wrench clockwise. Attach the other end of that hose to the outlet port of your pump. Disconnect the outlet hose on your water heater turning the wrench counterclockwise. Connect one end of your second water hose to the outlet port and place the other end inside a bucket. Attach one end of your third hose to the inlet side of the pump and place the other end into the same bucket.

Fill the second bucket with two gallons of vinegar. You should not dilute it.

Turn on your pump. It will suck vinegar from the bucket and circulate it inside the tankless water heater. The vinegar will then drain back into the bucket, where it will be recirculated. Allow this circulation to go on for about 30 minutes. You'll notice that the vinegar becomes cloudier as more lime dissolves.

Turn off the pump.

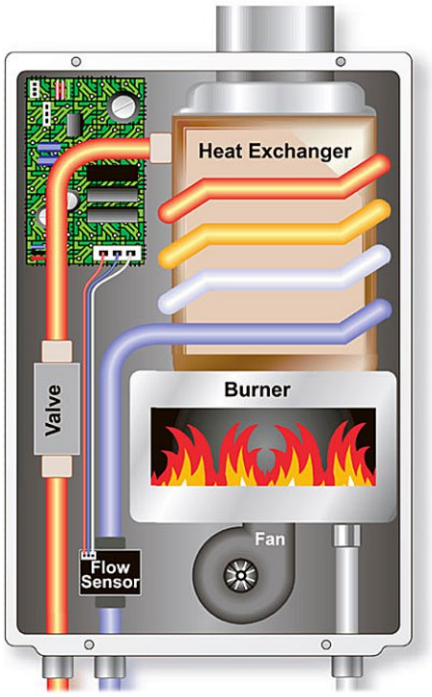
Rinse out the tank. Remove the bucket of used vinegar and replace it with five gallons of clean water. Turn on the pump for another 30 minutes and let the water rinse out the inside of the heater. The old vinegar can be dumped down the drain. It's a natural acid and won't hurt the pipes or the environment.
Turn off the pump.

Reassemble your tankless water heater. Reattach all the original hoses and turn back on the valves.

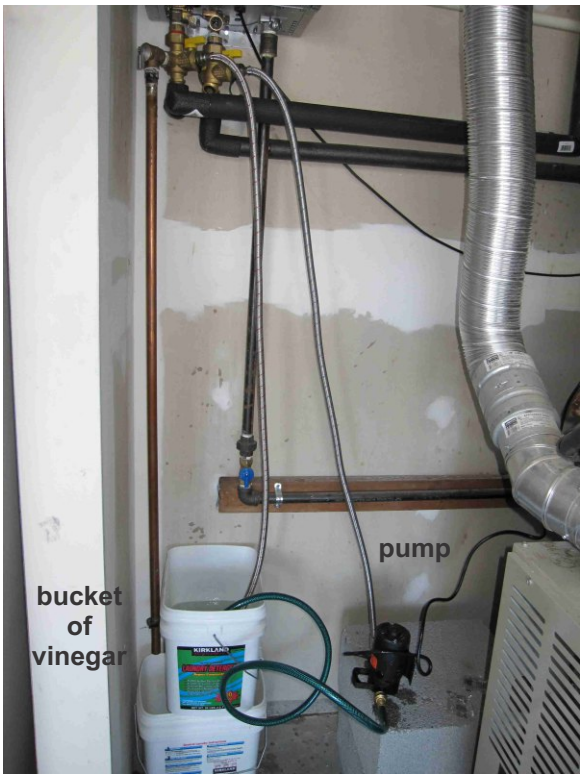
Run the hot water through the heater as a final rinse for about 15 minutes. Turn on the hot water in the shower or the sink to carry hot water through your system and push new hot water through the heater. Your system should be descaled and working as well as when it was new.

- Should The Tankless Be Cleaned Before Installing Scaleblaster?

In most cases the **ScaleBlaster** unit will remove the existing limescale buildup in the tankless water heater over time. However, because of the constant heating and cooling of the coil every time the heater turns on and off, the coil will expand and contract, which can cause the scale to pop off in little pieces as the descaling process continues. For this reason, the best results will be if you start off with a completely clean coil inside the tankless water heater.



tankless water heater



E. Residential Installations

- Sizing The Proper Residential Model

SB-75

SB-Elite

SB-MAX Pro

There are three premium residential models now available – the **SB-75, SB-Elite** and the **SB-MAX Pro**.

There are four main guidelines in determining the proper size for the residential ScaleBlaster units:

1). Water Hardness Level

2). Pipe Size

3). Pipe Type

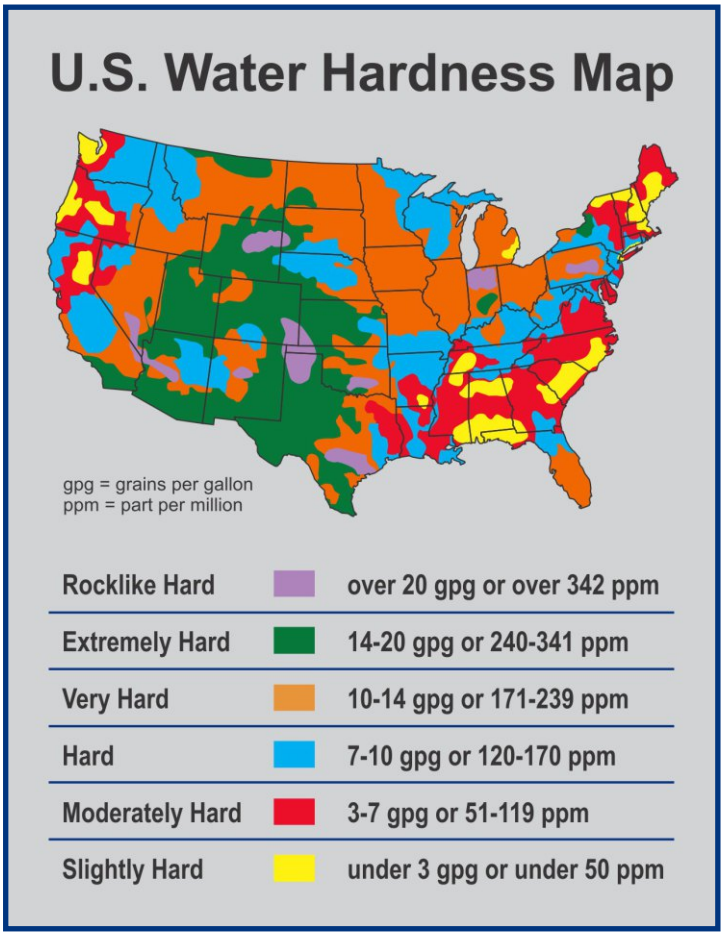
4). Size of House

1). Water Hardness Level

You can refer to the water hardness map in determining the water hardness level in your area, but this is only a general indicator. For example – well water will be much higher than city water as shown on this chart.

For reference: gpg=grain per gallon; ppm=parts per million, and is the same as mg/L.

The **SB-75** should be used on houses (indoor installation only) levels up to 19 grains per gallon (gpg) or 325 parts per million (ppm) and the **SB-Elite** levels up to 35 grains per gallon (gpg) or 600 parts per million (ppm) and the **SB-MAX Pro** used on water hardness levels up to 40 grains per gallon (gpg) or 684 parts per million (ppm)



Calcium Hardness Test Kit

We strongly recommend you get a calcium hardness test kit, such as part number CLA-139 sold by **Clearwater Enviro Technologies** / **ScaleBlaster**. We offer the best pricing on this Taylor Test kit and it comes with a **ScaleBlaster** sizing chart right on the cover. The test kit is easy to use and gives an immediate and accurate result. Replacement reagents are available at virtually any pool supply store.

2). Pipe Size

The size of the incoming water supply line going to your house is critical in determining the proper unit.

If you do not know the actual pipe size from eyeballing it, you can use this handy chart for guidance on determining the pipe size by measuring the pipe from the outside diameter:

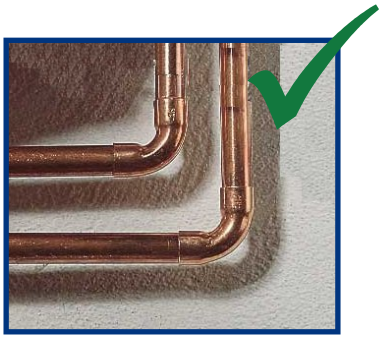
COPPER		PVC	
Outside Diameter	Actual Size	Outside Diameter	Actual Size
5/8”	1/2”	.84”	1/2”
7/8”	3/4”	1.05”	3/4”
1 1/8”	1”	1.315”	1”
1 3/8”	1 1/4”	1.660”	1 1/4”
1 5/8”	1 1/2”	1.900”	1 1/2”
2 1/8”	2”	2.375”	2”

The **SB-75** and **SB-Elite** can handle pipe sizes up to **1 ¼”** and the **SB-MAX Pro** can handle pipe sizes up to **1 ½”**.

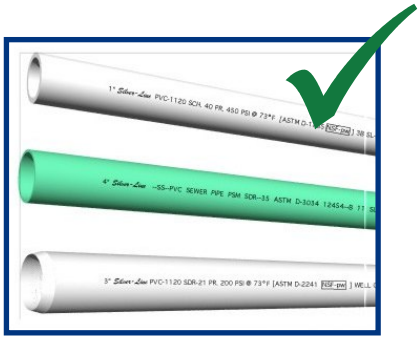
3). Pipe Type

ScaleBlaster will work on all types of pipe - ***except galvanized pipe.*** There are ways to overcome the galvanized pipe - if needed.

The unit will work fine on COPPER, PVC, CPVC and PEX pipe.



Copper Pipe



PVC, CPVC & PEX Pipe

Galvanized Steel Pipe

If the pipe is galvanized, you will need to replace a small section of pipe with either copper or PVC. This section should be about 12 inches or so. After plumbing in the new pipe, wrap the signal cable in the middle of the pipe, so there are a few inches of non-magnetic pipe before the signal cable and after it. It does not matter if the pipe is galvanized from that point forward. It will not hinder the **ScaleBlaster** signal, and descaling will take place.

Galvanized Pipe

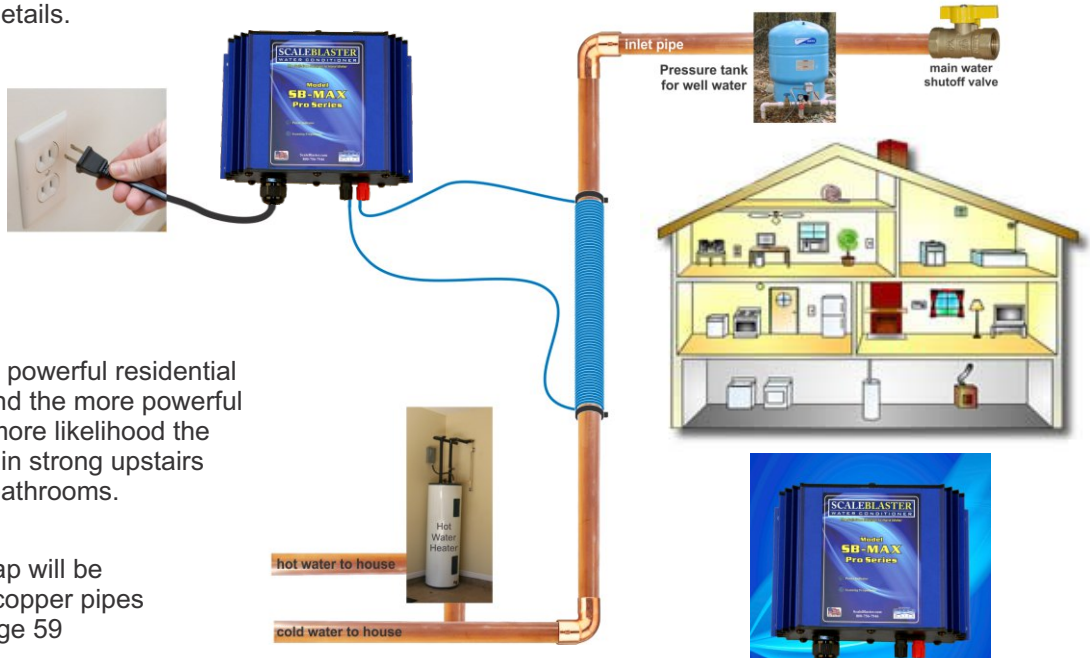
Special note should be taken: if the household pipes are old with galvanized pipe, there is a chance there are pinholes in the pipe actually held up by limescale deposits. **ScaleBlaster** will remove that scale and may actually reveal existing leaks! Advise the customer this may happen, as **ScaleBlaster** is not liable for these pinholes that have been there for decades.

Galvanized Pipe Warning!

Galvanized Pipe Warning!

4). Size Of House

If the size of the house is large (over 4,000 square feet) or has multiple levels or several bathrooms, the **SB-Elite** or **SB-MAX Pro** unit should be installed. If the house is over 5,000 square feet multiple units might be needed.
Contact us for details.



This is the most powerful residential unit we have, and the more powerful the signal, the more likelihood the signal can remain strong upstairs and in various bathrooms.

* a double wrap will be needed on copper pipes example page 59

- Determining The Location Of The Coil(s)

All coil wrappings on **ScaleBlaster Residential Models** should be installed on the incoming cold water main line before it splits off. Install the signal cable on the incoming cold water supply line entering the home as close to where it comes into the house as possible. Your water shut-off valve, where you would shut off all the water to your house, is on the cold water main. If you find the valve, you have found the main line. This will insure you are treating the entire house as well as the outside spigots and the kitchen.

If you have a private well, you will need to install the **ScaleBlaster** signal coil AFTER the well's pressure tank.

- Unable To Locate The Main Line?

If you cannot access the main line before it splits, follow the cold water line back as far as possible from the water heater and install there. You may not be treating all of the homes water, and you may be only treating the hot water.

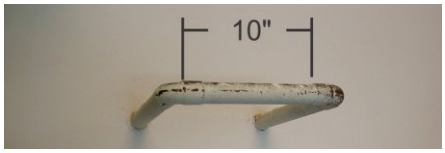
- Installing The Unit Outdoors

The **SB-Elite** and **SB-MAX Pro** can always be installed outdoors **(not the SB-75, indoor installations only)** if your home is built on a slab by adding PVC piping and an electrical box if necessary. This is needed if you only have a small amount of visible inches of the pipe going under the house's foundation and it splits up there.

You may also dig into the ground to install the signal cable, and replace the dirt after the coil is wrapped - if necessary. The dirt or underground conditions will not harm the signal in any way.

- Water Softener Loop

You can install the **ScaleBlaster** signal cable on the softener loop, usually located in the garage of the house, however this will only treat the water that the softener was treating and you may not be treating the kitchen faucet and outside spigots.



- Filtration Equipment

If the house has an entire filtration system on it to remove chlorine, iron, sediment and other contaminates, **it is best to install the ScaleBlaster downstream from the equipment.** The filters may actually take away the **ScaleBlaster** signal, so it is best to wrap the coil after the equipment.

Always install the signal cable away from any strong electrical interference items like a motor or the A/C unit. Keep it about two feet away (minimum).

- Electrical Interference

Never install the equipment in the same power outlet of the A/C system or the electrical motor nearby.

- Keep The Signal Cable Away From Couplings, Elbows, Tees And Valves

Important! For best results, wrap signal cable on a straight section of pipe of 12" or more. Keep the signal cable as far away from tees, elbows, angles, couplings, valves and any curved pipe.

- Determining The Location Of The Power Box

It is important that once you have determined where you want to install the signal cable, you plan on where the control box should be mounted. Obviously, you will need a solid surface using the enclosed mounting brackets and/or screws to mount the unit on. A custom built box or stand could be built if needed to mount the unit on.

- Limitation Of Signal Cable From Power Box To Pipe

When determining the location of the signal cable, it is very important that there is no more than 10 feet of wire being used between the **ScaleBlaster** terminal post and the location of where the coil is being wrapped on the pipe.

SB-75 has power transformer

inlet pipe

main water shutoff valve

Keep wires from touching each other - going from the terminals to the signal cable location on the pipe.

* a double wrap will be needed on copper pipes example page 59

No more than 10' of wire is allowed between the power box terminals and the signal cable location wrapped on the pipe.

At least <u>12" of straight pipe</u> is desired - away from elbows, tees, valves & couplings

hot water to house

cold water to house

It is also important that the wires do not touch each other – going from the terminals of the control box to the signal cable location on the pipe.

When installing the **ScaleBlaster** unit, keep the signal cable away from couplings, elbows, tees and valves. We prefer at least 12" of straight pipe. If that is not possible, a lower amount of straight pipe will work in most cases. We understand this can sometimes be an issue due to limitations of space. If in doubt, contact **Clearwater's** customer service department.

Indoor or outdoor installation

The **SB-Elite** and **SB-MAX Pro** are in weatherproof boxes and can be installed indoors or outdoors. The **SB-75** is not weatherproof and needs to be installed indoors or have it covered outdoors.

- Can The Power Unit Be Installed Horizontally, Vertically Or Even Upside Down?

Yes, the control box can be installed at any angle.

- Electrical Factors

Another important factor to consider when mounting the control box is electrical. The unit will work automatically on 115 VAC or 230 VAC, and all three of our premium residential models are UL and CUL listed (Canada).

The unit comes with a standard USA 115 VAC plug on the end. If you need to install the unit on 230 VAC, simply replace the plug or wire it directly to the power source. There is NO switching of controls required with the **ScaleBlaster** unit when converting from 115 VAC to 230 VAC. A nice little feature on all our models!
(NOT THE SB-75, USES 115VAC POWER TRANSFORMER INCLUDED)

The most important factor you need to consider, is that the power cord is 5 feet long, and since we are UL/CUL approved, we do not recommend using an extension cord to extend this more than 5'. **So, you will need electrical within 5 feet of the control box.** You may consult Clearwater engineers if you need to expand the power cord. A custom unit could be built with a longer cord, but that would not be UL/CUL listed.

- Wrapping The Pipe

Here is an example of a properly wrapped pipe. No gaps or loose wire wrappings are allowed!

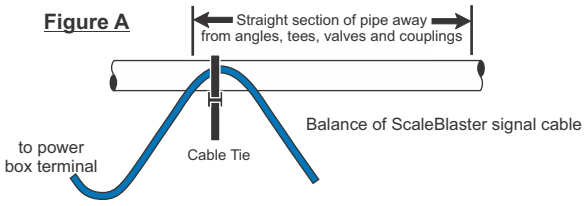
Never overwrap the coil more than the prescribed amount. If you go over the recommended amount, the impedance of the signal is greatly diminished and the unit will not do the job properly. Many people think more wraps will make it better, but that is not the case!

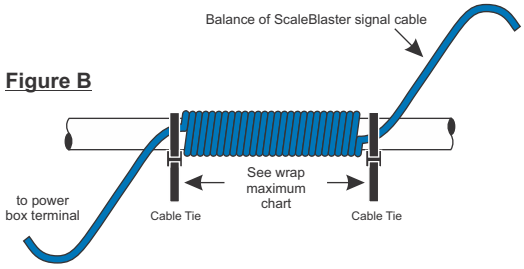
As noted earlier, never install extra wraps just because there is extra wire in the wire pack. There are a couple of reasons you most likely have extra wire:

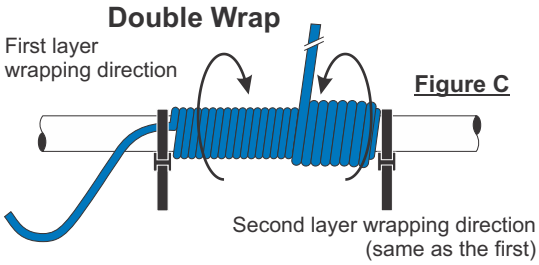
The **SB-75** and **SB-Elite** are designed to handle up to 1 ¼" pipe and the **SB-MAX Pro** is designed to handle up to 1 ½" pipe. If you installed the coil on ¾" pipe, there obviously will be extra wire left over.

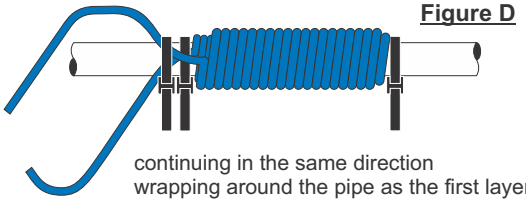
There is also extra wire on the roll in case you need to locate the signal cable a longer distance from the power box. You are allowed to go an extra 10 feet if you need to extend the distance from the power box to the coil wrapping location. **DO NOT INSTALL THE SIGNAL CABLE IF IT IS MORE THAN 10 FEET FROM POWER BOX.** With this method, you actually use an extra 20 feet of signal cable —10 feet of wire going to the power box and 10 feet coming back.

Always maintain the recommended number of wrappings. If you do not have the room for the recommended amount, you should consult Clearwater Enviro engineers.









Residential Models

SB-75, SB-Elite and **SB-MAX Pro

Copper

	Pipe Size	Pipe OD (in)	Number of Wraps	Type of Coil	Wire Gauge (AWG)	Length of Coil (in)	Expected Wire Usage (ft)*		Wire Pack Code	
	1/2"	0.625	50	Double	18	5.8	39.2		A	
	5/8"	0.750	50	Double	18	5.8	42.5		A	
	3/4"	0.875	50	Double	18	5.8	45.8		A	
	1"	1.125	45	Double	18	5.2	49.1		A	
	1 1/4"	1.375	40	Double	18	4.6	51.1		A	
**	1 1/2"	1.625	35	Double	18	4.0	51.8		A	

PVC/PEX

	Pipe Size	Pipe OD (in)	Number of Wraps	Type of Coil	Wire Gauge (AWG)	Length of Coil (in)	Expected Wire Usage (ft)*		Wire Pack Code	
	1/2"	0.840	38	Double	18	4.4	38.9		A	
	3/4"	1.050	70	Single	18	8.1	39.2		A	
	1"	1.315	57	Single	18	6.6	39.6		A	
	1 1/4"	1.660	50	Single	18	5.8	41.7		A	
**	1 1/2"	1.900	40	Single	18	4.6	39.9		A	

* Expected Wire usage includes the wire used on the coil and both leads (10ft ea) connecting the unit to the coil.

Using one of the cable ties, secure the wire to the pipe. **(Figure A)**

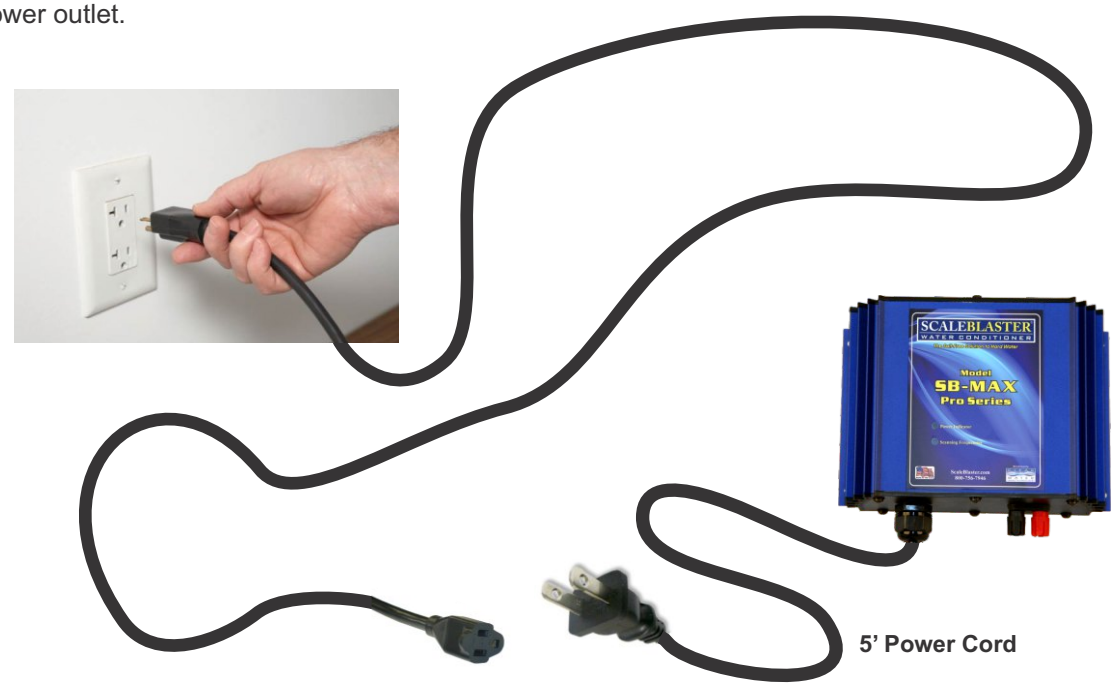
Using a second cable tie at the end of the wrappings, secure the wire to the pipe, keeping all the wraps tight. **(Figure B)**

YOU MUST KEEP THE SECOND WRAPPING IN THE SAME DIRECTION AS THE FIRST! Wrap right over the top of the first layer continuing in the same wrapping direction as the first layer. This second layer must also be tight and touching the prior wrap. **(Figure C)**

Using a third cable tie at the end of the wrappings, secure the wire to the pipe, keeping all the wraps tight. **(Figure D)**

- Extension Cords

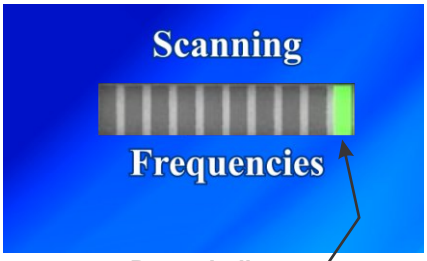
Though we do not encourage it, you can add an extension cord if needed to extend the cord going to the power outlet.



5' Power Cord

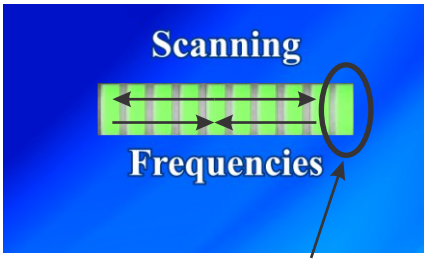
- LED Light Indicators

The **SB-75** and **SB-Elite** has an LED light on the front panel. If the unit was installed for power only and not with a complete signal coil wrapping, only the far right light will come on. Once the signal cable has been wrapped and connected to the power box terminals, the unit's LED will have all the green LED lights come on and oscillate back and forth continuously except for the one on the far right — which should stay on all the time.



Power Indicator
Power ON only

SB-75 and SB-Elite

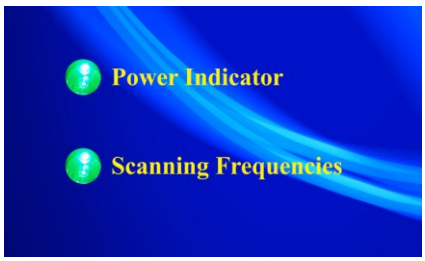


Power indicator LED stays on all the time ,while other lights oscillate back and forth when signal cable is wrapped.

The **SB-MAX Pro** has two indicator lights on it. One of them is a "Product Indicator" and will light up when power is going to the unit. The other light is called "Scanning Frequencies", and will light up when the unit as a proper connection with the signal cable scanning frequencies.

Power on only

SB-MAX Pro



Both LED lights are on when signal cable wrapped

F. Commercial & Industrial ScaleBlaster Models

- Commercial Models

Virtually any equipment you have that comes in contact with hard water is costing you money. Water heaters, dishwashers, sinks, toilets, shower heads, aerators, steam tables & ovens, ice machines, swimming pools and laundry equipment, towels, bed sheets, etc. are all affected by hard water. Water taste is bad; the building's pipe system will need replacement. Expenses in maintaining a cooling tower, boiler or chiller are often your costliest equipment to maintain – all because of hard water.

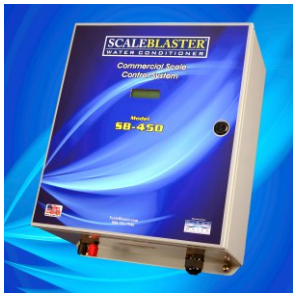
There are 4 commercial models and one unit designed for commercial ice machines.

All of the models work on 115 or 230 VAC automatically, except the SB-ICE50 which is 115VAC only.

SB-ICE50

SB-250

SB-350



SB-450

SB-650

- Benefits For Your Entire Operation.

Cooling Towers - Huge savings in maintenance, biocide chemicals, labor and water usage. **ScaleBlaster** reduces scale buildup, bacteria, Biofilm, corrosion and algae blooms. It will reduce makeup water/ blow downs substantially, resulting in huge water savings. It will increase life of equipment and lower energy costs by about 10%.

Chillers / Condensers / Air Handlers - Lime scale deposit control on heat exchanger tubes and surfaces resulting in energy savings of 5-7%.

Boilers - Huge savings in chemicals and labor maintenance. Reduces scale formation on boiler fire tubes, condensation tank, pumps, pipes and valves. Lowers energy costs by 25% and extends equipment life.

Water Heater Tanks - Water heaters work more efficiently resulting in huge energy savings. Scale control on heating coil and tank.

Dishwashers - Lime scale buildup in the dishwasher lines and on glassware and dishes will be reduced.

Steamers - Your steamers will require little or no maintenance for scale build-up.

Ice Machines - Scale deposits can cause cubes to be cloudy and clogs in the water flow. **ScaleBlaster** reduces filter clogs, Biofilm and contaminants. Maintenance and downtime are also reduced and equipment lasts longer.

Laundry - Scale deposit control in steam ironing machines, washing machines. You will typically cut detergent use in half. Clothes and towels will feel softer, look brighter and last longer, making your clients feel more pampered.

Drinking Water, Coffee Machines, Soda Dispensers - The water will taste much better because the breeding ground of bacteria (scale in water pipes) is gone. By keeping calcium in the water, coffee and cappuccino will taste better.

Housekeeping / General Cleaning - Huge savings are realized in all phases of cleaning including the bathrooms and in the kitchen because there is less scale buildup in toilets, showers, nozzles and faucets. Reduced labor and savings in cleaning chemicals benefit your bottom line.

Aerators - Aerators will no longer clog up with scale formation, resulting in the elimination of nuisance cleaning and replacement.

Plumbing System - Your entire building's plumbing system will be descaled without any chemicals or re-plumbing. This results in huge savings in heating costs. If the plumbing ever needed replacement in the building, the cost would be astronomical.

Swimming Pools And Hot Tubs - Lime scale deposit in the filtration equipment and pool walls will be eliminated.

- Industrial Models

Scaling is a major problem for the industry. Until now, the only reliable solution was expensive chemical scale inhibitors. In an era of environmental concerns, these traditional methods are simply outdated.

After several years of research and development, **Clearwater Enviro Technologies**, a high-tech environmental company from Clearwater, Florida has developed a compact, state-of-the art, electronic descaling system to solve hard water problems without the need of chemicals, water softeners, and continuous maintenance. This innovative product produces an oscillating electronic field using a unique and complex modulating frequency wave form that produces an inaudible sonic impulse that changes the electrical and physical properties of the calcium carbonate crystals and other minerals to repel rather than adhere to pipes, fixtures and heat transfer surfaces.

There are five industrial models for pipe sizes up to 40".
All models come in a rugged metal box and have a full digital readout display


SB-1200


SB-2000


SB-2800


SB-3600


SB-4000

Prevents Scale Accumulation - Scale particles in the water receive an enhanced surface charge causing them to repel from each other and from pipe walls & equipment like tubes, jets and heat transfer surfaces

Removes Existing Scale - Any existing scale within the system is removed within weeks and never returns.

Eliminates Toxic Chemicals - Chemical scale inhibitors can be reduced or totally eliminated. No handling and storage of hazardous chemicals on site.

Environmentally Friendly - Discharge water regulations have made the disposal of chemically treated water a regulatory concern. **ScaleBlaster** is non-invasive and adds nothing to the water, simplifying your compliance measures.

Reduces Corrosion - Reduces bio-corrosion by preventing the formation of bio-growth on surfaces where bacteria can attack the metal. Increases the cycles of concentration in cooling systems resulting in significant water savings.

Controls Algae & Bacteria - Algae and bacteria need to attach to something before they can feed and reproduce. **ScaleBlaster** keeps algae, bacteria and their food dispersed in the water, away from their biofilm breeding ground. The biofilm will die, too.




Huge Energy Savings - The primary energy savings are a result in a decrease in energy consumption in heating or cooling applications. These savings are associated with the removal of scale formation. Just a 1/4" of scale buildup can increase energy consumption 40%.

Reduces Maintenance & Downtime - The constant necessity of monitoring equipment, adding chemicals, balancing water chemistry and cleaning shutdowns will be greatly reduced. **ScaleBlaster** itself requires no maintenance.

Extends Life of Capital Equipment - **ScaleBlaster** will extend equipment life dramatically, maximizing the return on capital investment.



– Sustainable Results, Benefits & Savings –

RESULTS
- Removes existing scale & prevents new scale formation
- Algae, Biofilm, fungi & other microorganisms are virtually eliminated
- Increase cycles of concentration to 6 or more - significantly reducing “bleed off”
- Water clarity improves
- Bacteria counts reduced
- Reduced corrosion & pitting from bacteria

BENEFITS
- Greatly reduce or eliminate chemical usage
- Ease of liability, safety, regulatory, & EPA concerns
- Reduce overall cooling tower maintenance expenses
- Eliminate scale and Biofilm as a breeding ground for harmful bacteria – including Legionnaire's Disease
- Eliminate fouling of the chiller

SAVINGS
- In chemical costs alone, the savings are substantial. Chlorine, biocides, acids & phosphates & similar compounds may be eliminated
- Chemical storage, regulation and compliance issues
- Huge energy savings from improved heat transfer as a result of scale and Biofilm elimination
- In “Green” building tax credits
- Huge savings in water usage and disposal fees
- Extends life of capital equipment and downtime

G. - Commercial & Industrial Installations

- Sizing The Proper Model

Important notice: ***When sizing the proper model for any commercial / industrial application, we strongly recommend you contact ScaleBlaster/Clearwater Enviro Tech engineers for proper sizing. This section will only be a guideline as far as the actual sizing the unit goes.***

There are seven important factors to consider when sizing any commercial or industrial model:

A. Pipe size (diameter)
B. Pipe type (copper, pvc, cpvc, galvanized, steel ductile iron, etc.)
C. Water hardness level (gpg or ppm)
D. Flow rate
E. Application the unit is getting installed on
F. Location of the equipment
G. One shot or recycled water

A. Pipe Size

One of the most critical factors in sizing the proper commercial and industrial models is the pipe size. Sizing is always determined by the inside diameter of the pipe. ScaleBlaster will work on any pipe size from ¼" to 40" pipe and there are twelve (12) commercial and industrial models to fit that size.

SCALEBLASTER® WATER CONDITIONER

ScaleBlaster Model Comparison Chart

Manufactured by CLEAR WATER ENVIRO TECHNOLOGIES

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CLM-408

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		Model Number	Warranty	Retail Price	GPG Capacity	Indoor and / or Outdoor Use	Non-Magnetic (PVC /Copper, etc.) Pipe Size (dia.)	Magnetic (One-Shot) Pipe Size (dia.)	Magnetic (Recirculating) Pipe Size (dia.)
Residential		SB-75 (under 4,000 square feet)	3 years	$199.00	1-19 gpg	Indoor use or covered area only	1.25"	N/A	N/A
		SB-Elite (up to 5,000 square feet)	3 years	$495.00	up to 35 gpg	Indoor and Outdoor use	1.25"	N/A	N/A
		SB-MAX PRO (under 5,000 square feet)	10 years	$595.00	up to 40 gpg	Indoor and Outdoor use	1.50"	N/A	N/A
Commercial		SB-250	5 yeras	$2,195.00		Indoor and Outdoor use	2"	N/A	1"
		SB-350	5 years	$3,995.00		Indoor and Outdoor use	3"	1"	1.50"
		SB-450	5 years	$5,995.00		Indoor and Outdoor use	4"	1.50"	2"
		SB-650	5 years	$7,995.00		Indoor and Outdoor use	8"	1.50"	2"
Industrial		SB-1200	3 years	$11,995.00		Indoor and Outdoor use	12"	3"	6"
		SB-2000	3 years	$14,245.00		Indoor and Outdoor use	20"	8"	14"
		SB-2800	3 years	$22,495.00		Indoor and Outdoor use	28"	10"	20"
		SB-3600	3 years	$29,995.00		Indoor and Outdoor use	36"	12"	24"
		SB-4000	3 years	$34,870.00		Indoor and Outdoor use	40"	16"	26"
Misc.		SB-ICE50	5 years	$395.00		Indoor use or covered area only	Comes with pre-wrapped ½" pipe and quick connect fittings (for commercial ice makers)		

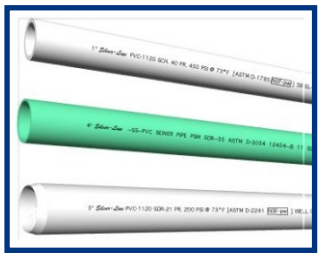
NOTE: Not all ferrous based pipes have "magnetic characteristics". Only refer to the magnetic section of this sizing chart if a regular magnet will stick to the outside of the pipe. If the magnet does not stick, please refer to the "non-magnetic" section.

B. Pipe Type

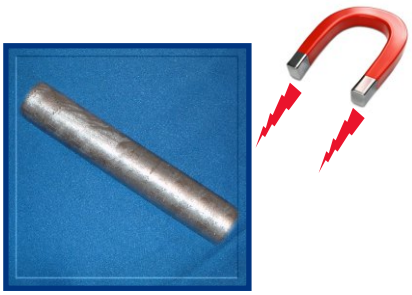
The type of pipe is equally important as pipe size, especially when it comes to commercial and industrial applications, where often the pipe may be magnetic. Not all metal pipes are magnetic as well as all ferrous pipes. If the pipe is magnetic, a much stronger model needs to be installed in order to "penetrate" the pipe with our signal. Generally the unit will need to be 3-4 times the power if it is installed on magnetic pipe vs. non-magnetic pipe. For example:

An SB-650 would work on 8" pvc pipe. But if the pipe were magnetic, this unit is sized for up to 1 ½" magnetic pipe.

Copper Pipe



PVC, CPVC & PEX Pipe



Galvanized Steel Pipe

A magnetic pipe is one where a magnet will stick to the pipe itself. A simple refrigerator magnet would work also. You should always test to be safe – a lot of times people think stainless steel is magnetic pipe, when many times it is not.

A lot of the time, the pipe is insulated, or painted and may be difficult to tell what type of pipe it is. Always test with a magnet. Failures are rare with our installations, but if they do occur, it is normally because the unit was undersized. Once in a while, a unit may be sized assuming it was going to get installed on copper pipe, when it may be actually carbon steel, galvanized or ductile-iron pipe. A unit undersized because it was assumed it was non-magnetic pipe when in fact it was magnetic pipe will not work.

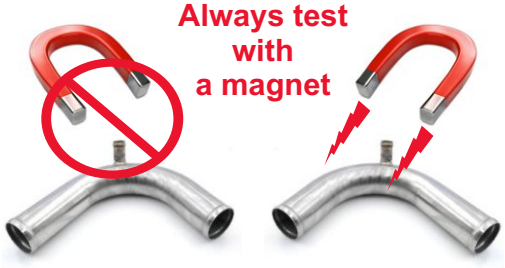
- Stainless Steel Pipe May Be Magnetic Or Non-Magnetic

Stainless steels are a very broad group of metals. The name was adopted as a generic term for steel alloys with a minimum of 10.5% chromium. The chromium gives the steel its 'stainless' properties - essentially corrosion resistance. On the surface of the metal, a very thin chromium-rich oxide layer is formed which is inert - i.e. it prevents the steel from rusting. The advantage of stainless steels over plated steels is that, if scratched or damaged, the steel will 'self-repair' as a new oxide layer is formed. In plated steels, scratches in the plate will often lead to corrosion of the steel underneath.

In general, the higher the proportion of chromium, the stronger the corrosion resistance of the steel. In addition to chromium, other metals are added to give the steel particular properties such as strength and malleability. Specifically nickel is used to strengthen the oxide layer.

As for whether they are magnetic, the answer is that it depends. There are several families of stainless steels with different physical properties. A basic stainless steel has a 'ferritic' structure and is magnetic. These are formed from the addition of chromium and can be hardened through the addition of carbon (making them 'martensitic') and are often used in cutlery. However, the most common stainless steels are 'austenitic' - these have a higher chromium content and nickel is also added. It is the nickel which modifies the physical structure of the steel and makes it non-magnetic.

So the answer is yes, the magnetic properties of stainless steel are very dependent on the elements added into the alloy, and specifically the addition of nickel can change the structure from magnetic to non-magnetic. **Always test the pipe if it is stainless steel to see if it is magnetic pipe or not.**



- Replacing Magnetic Pipe With Non-Magnetic Pipe

If the pipe is magnetic, this means that a unit will need to be sized properly at normally 3-4 times the power, which may be out of the budget for the application. In other words, if the application called for 6" magnetic pipe, the unit required would be the **SB-2000**. The retail price of that unit is nearly double that of the **SB-650**, which would be the unit used if the application was on a non-magnetic pipe like pvc.

There is a simple remedy for this – if it can be allowed. You can replace an area of pipe where the signal cable is from the magnetic pipe to pvc or copper. You will need to determine the length of the wrappings – for example 50 wraps may take up 6" of pipe. The area of pipe cut out should allow for a few extra inches on either end of the pipe that you are cutting out. For example, if the pipe wrapping will take up 6" of the pipe, the location to cut the pipe would be that area and perhaps 3" inches on each other side. A total of 12" would need to be cut out and replaced with the non-magnetic pipe.

However, not all types of applications will allow you to remove the steel or magnetic pipe. Boilers are a perfect example. PVC and copper would never hold up at very high temperatures and pressure levels the boiler may require, where the iron based pipe will. In this case, the more powerful unit needs to be installed.

C. Water Hardness

Another factor is water hardness. All of our units are sized for very hard water. But in some unusual and extreme applications we have seen with installations on the power plants in China, huge boilers in Africa, waste water treatment plants and with Dow Chemical worldwide, the type and amount and type of scaling is amazing. In Mexico, our units are installed on hundreds of geothermal plants where we are treating steam and not actual water flowing past a pipe.

Always know the water hardness level.

The hardness level may be at a reading too high that the scale formation can only be controlled to form at a slower pace. In other words, if the hardness was 200 gpg, chances are some scaling will form, but at a slower pace. The pipes or boiler would need to be cleaned out manually, but nowhere near as often. The blow down or shutdown times may be extended where the maintenance was normally required monthly, but with **ScaleBlaster** installed, it may reduce these service calls to once every six months, for example. In circumstances like this, a water softener would not work or would need to be oversized to the point where it would be too costly to operate. Circumstances like this are rare, but we do run into them on occasion.

D. Flow Rate

The flow rate is an important factor. We are never concerned about a fast flow rate, because the greater the flow rate, the quicker the descaling will take place! If the flow rate is very slow where water trickles past the signal cable, the unit may not work. Always consult with Clearwater Enviro engineers if in doubt.

E. Application

No two types of applications are the same. As we mentioned earlier, some of the applications we have our equipment in are very unique, like Dow Chemical. One application may need a more powerful unit given the circumstances.

When installing the equipment, you must also determine what our unit can do to solve one's problem. An example could be car washes. If the guy is looking at reducing the spotting on cars, **ScaleBlaster** may not always work because of phosphates in the recycled water that is used.

F. Location On Equipment

There are several factors that will determine where the unit will need to be located. In some cases, multiple units will need to be installed. **ScaleBlaster 101** will briefly review some key details later in this section.

G. One Shot Or Recycled Water

Another important factor is if the water is passing the signal cable just that one time, or multiple times, in a recirculated mode. The more times the water is treated or exposed to our signal, the better the results will be, and will allow you to use a smaller unit if the pipe is magnetic and the water will pass our signal cable many times. Check the Model Comparison Chart. You will notice a comparison of magnetic pipe - one shot sizing vs. magnetic pipe - recirculating. Generally you can double the size of pipe if it is on recirculated water.

Sizing The Proper Commercial Unit

SB-250 - Maximum 2" pipe (non-magnetic)
-Water hardness 1-100 gpg
-Pipe type – copper, pvc, cpvc, pex, non-magnetic steel pipe

SB-350 - Maximum 3" pipe (non-magnetic)
- 1" steel pipe magnetic (1 shot) 1 ½" (recirculating)
- Water hardness 1-100 gpg
- Pipe type- copper, pvc, cpvc, pex, non-magnetic steel pipe (in addition to magnetic pipe listed above)

SB-450 - Maximum 4" pipe (non-magnetic)
- 1 ½" steel pipe magnetic (1 shot) 2" (recirculating)
- Water hardness 1-100 gpg
- Pipe type- copper, pvc, cpvc, pex, non-magnetic steel pipe (in addition to magnetic pipe listed above)

SB-650 - Maximum 8" pipe (non-magnetic)
- 1 ½" steel pipe magnetic (1 shot) 2" (recirculating)
- Water hardness 1-100 gpg
- Pipe type- copper, pvc, cpvc, pex, non-magnetic steel pipe (in addition to magnetic pipe listed above)

SB-ICE50 - Commercial Ice Maker Model
- Complete ice maker package - descaler & filter
- Includes pre-wrapped pipe & coil
- Includes 1000-gallon filter to reduce chlorine taste & odor

Sizing The Proper Industrial Unit

SB-1200 - Powerful 6 amp output.
- Maximum pipe size: Non-ferrous pipe - 12"
- Ferrous pipe - 3" (6" on recycled)

SB-2000 - Powerful 10 amp output.
- Maximum pipe size: Non-ferrous pipe - 20"
- Ferrous pipe - 8" (14" on recycled)

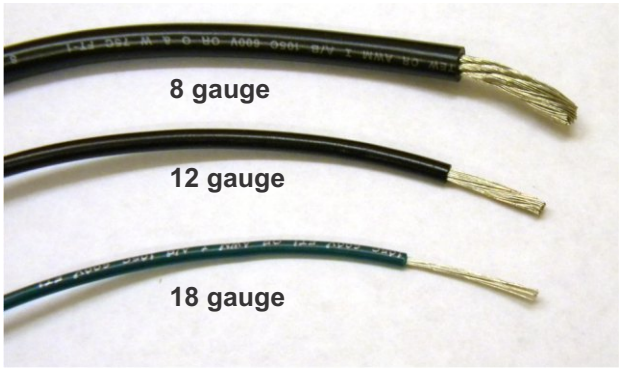
SB-2800 - Powerful 2 x 10 amp output.
- Maximum pipe size: Non-ferrous pipe - 28"
- Ferrous pipe - 10" (20" on recycled)

SB-3600 - Powerful 3 x 10 amp output.
- Maximum pipe size: Non-ferrous pipe - 36"
- Ferrous pipe - 12" (24" on recycled)

SB-4000 - Powerful 4 x 10 amp output.
- Maximum pipe size: Non-ferrous pipe - 40"
- Ferrous pipe - 16" (26" on recycled)

- Various Signal Cables

The residential, commercial and industrial units all use their own special sizing of wiring. The residential units (**SB-75**, **SB Elite**, **SB-MAX and SB-MAX Pro**) and the **SB-250** use the 18 gauge wire, the **SB-350**, **450** and **650** all use 12 gauge wire, and the industrial models – (**SB-1200** through the **SB-4000**) all use 8 gauge wire.



- Extremely Hot Water Pipes

On some occasions, the temperature of the pipe is too hot for the regular signal cable. Our wires can handle up to 105 degrees Celsius, or 221 degrees Fahrenheit. If the pipe is over the rated temperature of our normal signal cable, we have a special wire that you can use that will handle temperatures up to 200 degrees Celsius, or 392 degrees Fahrenheit.

We normally do not keep the wire in stock since it is rare we have to use it. The cost is quite expensive, so if you require a unit with this special wire, you will have to special order the unit. A surcharge will incur when ordering.

- Commercial Installations

There are all sorts of commercial installations possible with our equipment. Here is a basic example of an installation that would handle most health care facilities, hotels, or large buildings:

Install On The Main Water Supply Line Going To The Building

Unless you are treating a specific application like a cooling tower or a boiler, you generally install a unit on the incoming water supply line. Generally, this will be the largest unit that you install at this location. If the pipe is 6", install the **SB-650**.

Install A Unit In Front Of The Dietary (Kitchen) Area

On commercial installations, it is best to install an additional unit in the kitchen area, especially on the dishwasher line.

ScaleBlaster is mainly a descaler, it will keep the heating coils clean of scale, and the dishwasher itself – including the spray nozzles. Anytime the spotting issues are solved, it is a bonus. If spotting on glasses is an issue with the customer, there is no guarantee **ScaleBlaster** will totally remove spotting. It may reduce it in many cases. Remember, we do not remove calcium from the water, and with the hot water temperature and high levels of phosphates in the soap detergents, the **ScaleBlaster** should never be marketed as a calcium spot remover.

The kitchen area may also have other applications like the steamers and the coffee machine where the **ScaleBlaster** unit will help.

Install A Unit In The Laundry Room

If the commercial building has a laundry room, it is best to install a unit before the washing machines. This is also based on pipe size, and generally the **SB-250** is sufficient here. There are several benefits the **ScaleBlaster** will help here. Generally, this is one of the first places you will notice the benefits of **ScaleBlaster.** Operators will be able to cut back on soap use, the lint in the lint basket will subside, the colors will be brighter, the whites will come out "whiter", and the clothes and towels will all have softer feeling to them.

- Boilers

Steam And Utility Boilers (Water Tubes And Fire Tubes)

***ScaleBlaster location* - Install on both locations if applicable**

a. **After feed water pump**
b. **On make-up fresh water pipe**

ScaleBlaster sizing

Use accompanying ScaleBlaster Model selection chart **TABLE 1** by Pipe Type and Mode of Operation for installation on the *Feed Water Pipe*. The boiler capacity is important and ScaleBlaster should be sized based on this, but never undersize the pipe size.

Table 1: SB Sizing by Boiler Capacity and Feed Water Pipe Size and Type

BOILER RATING	COMMERCIAL (=/<4000 Kg/h)			INDUSTRIAL (>4000Kg/h)			
KGPH (Kg/h)	1,000	2,500	4,000	10,000	15,000	20,000	25,000
PPH (LB/h)	2,200	5,500	8,800	22,000	35,000	44,000	55,000
BHP	60	160	256	600	1,000	1,300	1,600
BTU/h	2,205,000	5,512,000	8,800,000	22,000,000	35,000,000	44,000,000	55,000,000
KW	650	1,600	2,500	6,500	9,500	13,000	16,000
EDR	9,200	23,000	36,750	92,000	138,000	183,750	230,000
MBH	2,200	5,500	8,800	22,000	35,000	44,000	55,000
PIPE SIZE							
STEEL	1"	1-1.5"	1.5-2"	2-3"	3-4"	4-6"	4-6"
PVC/COPPER	1.5-3"	2-4"	3-4"	NA	NA	NA	NA
SB MODEL	**SB-350**	**SB-450**	**SB-650**	**SB-1200**	**SB-1400**	**SB-1800**	**SB-1800**

Use the ScaleBlaster model chart – **TABLE 2** when sizing on the *Fresh Water Make-up Pipe.*

Table 2: Sizing of Commercial and Industrial SB Model by Pipe Size and Type

APPLICATION	MODEL NO.	PVC/COPPER	FERROUS (One-shot/Open Loop)	Ferrous Recirculation/ Closed Loop with Make-Up
COMMERCIAL	SB 350	Up to 3"	Up to 1"	Up-to 1.5"
	SB 450	2-4"	1.5"	2"
	SB650	3-8"	1.5"	2"
INDUSTRIAL	SB 1200	6-12"	2-3"	3-6"
	SB 1400	10-14"	3-4"	4-8"
	SB 1800	12-18"	4-6"	6-12"
	SB 2000	16-20"	6-8"	8-14"
	SB 2800	18-28"	8-10"	10-20"

- Cooling Towers And Chilled Water Plant

Sizing is generally a function of the pipe size and material of the pipe. The location(s) of the **ScaleBlaster** may differ due to installation variations. Descaling and scale build-up prevention are to insure improvements in energy efficiency in all cooling tower applications and chilled water plants. See TABLE 2 for sizing.

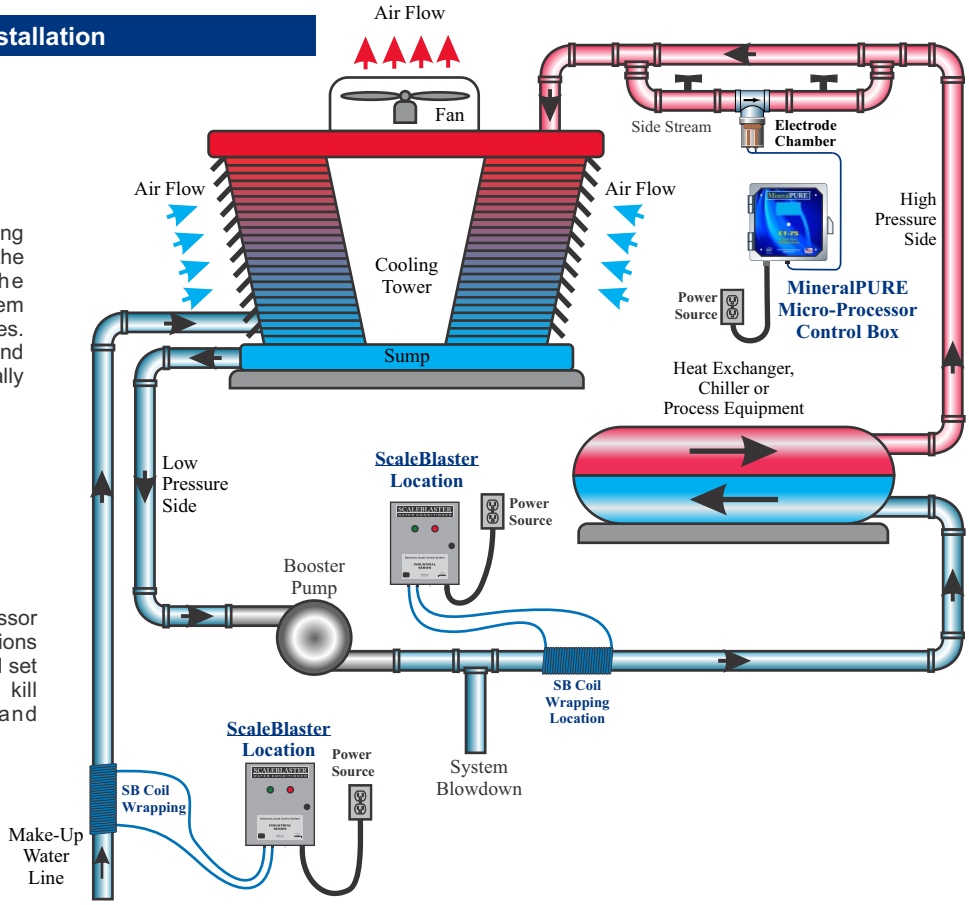
Typical Installation

ScaleBlaster
The Electronic Descaling System

Produces a complex modulating frequency waveform that hits the resonant frequency of the calcium molecules, causing them to lose their adhesive properties. Scale deposits are removed and never return. The unit is totally maintenance-free.

Mineral Pure
The Copper/Silver Ion Generator

Digitally controlled microprocessor produces copper and silver ions from a scientifically developed set of electrodes. These ions kill algae, Biofilm, bacteria and viruses.



- Industrial Models

ScaleBlaster has 5 industrial units, the **SB-1200**, **2000**, **2800**, **3600** and the **SB-4000**. The units can handle any size pipe up to 40" (nonmagnetic).

The **SB-2000** has 10 amps of power, while the **SB-2800** has 20 amps of power, the **SB-3600** has 30 amps of power, and the **SB-4000** has a powerful 40 amps of power.

All of these models are custom set internally. All the dip switches need calibration to set the power to match the pipe size, pipe type, and to some degree, the pipe thickness.

Whenever a unit is ordered, **Clearwater Enviro** engineers will calibrate the unit based on the given pipe size and type.

- Never Relocate A Unit That Has Been Sized For That Particular Pipe

Never get a unit sized for a particular pipe location, and then move the unit to a different location or a different application without consulting Clearwater Enviro engineers. The unit will need recalibrating.

Several years ago, one of the world's largest companies, a chemical manufacturer, had a couple of units installed at one of their plants in Germany. One of them was moved to another location without notifying us, and the unit stopped working properly (as far as descaling), leaving them with a "foul taste" in their minds of **ScaleBlaster.**

All units need to be calibrated for the given sized location. When dealing with the industrial units, the inductance of the coil must meet the proper standards for a signal to release the proper square wave.

- Installing An Industrial Model

Installing an industrial model is similar with the residential and commercial models, but there is much more to pay attention to.

Outdoor Installations

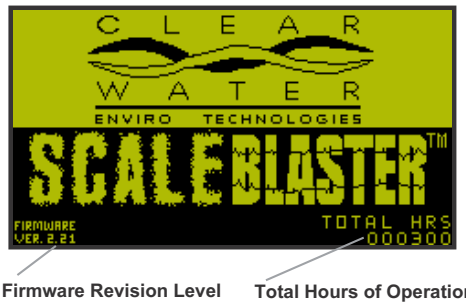
The box is in a NEMA 4 enclosure, but should be shielded if installed outdoors. Keep the unit out of direct sunlight for heat purposes, and away from the nasty elements of snow, sleet or freezing rain. This is a very sophisticated piece of equipment with a complicated computer circuitry that must deliver precise square wave signals at a fine-tuned frequency.

LCD Indicator Screen

This ScaleBlaster unit has an LCD screen on the front of the control box that provides information on operation on the descalers operational condition.

Startup Screen

The startup screen is displayed for approximately 10 seconds while the unit initializes.

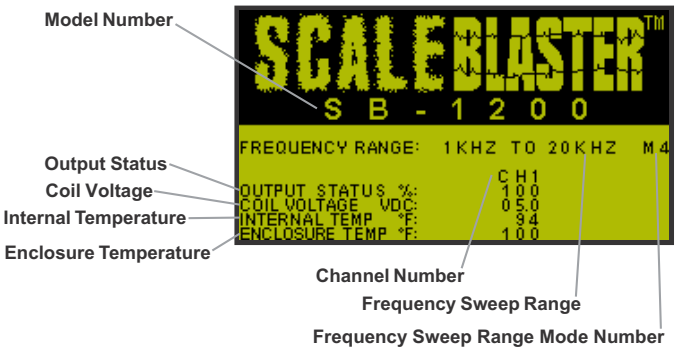


Firmware Revision Level

Total Hours of Operation

Main Screen

The main screen shows most of the operation condition of the ScaleBlaster control box.



- Descriptions Of Some Of The Screen Indicators:

Model Number: **ScaleBlaster** 'industrial' models include the **SB-1200**, **SB-2000**, **SB-2800**, **SB-3600**, and **SB-4000**.

Output Status: Output status of the coil current. The value of "100" indicates that the unit is functioning at 100%.

Coil Voltage: This is the voltage applied to the induction coil (i.e., the coiled wraps on the pipe). These values should always be between 19.5 and 20.5 volts direct current.

Internal Temp: This value indicates the internal temperature in degrees Fahrenheit.

Enclosure Temp: Displays the temperature, in degrees Fahrenheit, of each channel's heat sink.

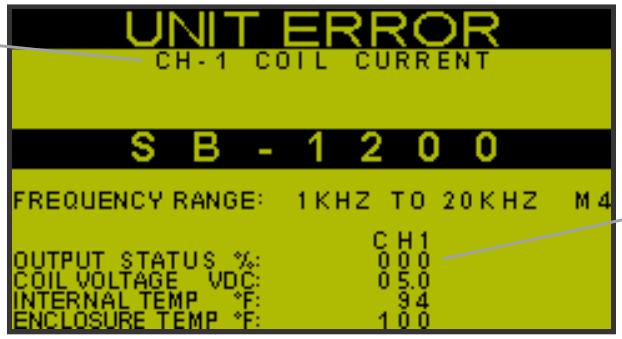
Frequency Sweep Range: Frequency range the descalers output will sweep between.

Mode Number: This number identifies a particular frequency sweep range, as set by the DIP switch. The unit is designed to permit selecting from among several pre-set sweep ranges via the DIP switch.

- Error Screen and Codes

This **ScaleBlaster** unit constantly scans for any malfunctions in the operation status of the unit. If an error is detected it is logged reported via the Unit Error Screen. This screen will display the channel and error that has occurred. A brief description of these errors are described below.

Error List: Displays channel number and type of error that has occurred. List holds up to four errors.



Error: In this example, the reading of "000" for the output status indicates a problem with the current at the coil for Channel 1. "RED LIGHT"

Sample Error Screen

INTERNAL TEMP Error **Displayed as: CH-1 INTERNAL TEMP**

The internal temperature sensor has recorded a temperature that is too high (above 150º F, 65.6º C) and has shutdown that channel. One possible cause for this error is that the unit was installed in a location exposed to direct sunlight, which may make the unit overheat. Another possible reason for this is a failure of internal circuitry causing excess heat buildup. In this case, contact your dealer or Clearwater Enviro Technologies, Inc.

ENCLOSURE TEMP Error **Displayed as: CH-1 ENCLOSURE TEMP**

Enclosure and slave board heatsink temperature sensor has recorded a temperature that is too high (above 150º F, 65.6º C) and has shut down that channel. Possible cause for this error: internal circuitry failure. Contact your dealer or Clearwater Enviro Technologies, Inc.

SMPS VOLTAGE Error **Displayed as: CH-1 SMPS VOLTAGE**

The value shown at "Coil Voltage" is the main output in volts from the Switch Mode Power Supply located inside the control box. If this error occurs, check the output binding posts for that channel to make sure that they are not directly shorted together. If not, then there must be a failure of internal circuitry. Contact your dealer or ClearwaterEnviro Technologies, Inc.

COIL CURRENT Error **Displayed as: CH-1 COIL CURRENT**

This indicates a failure in the main output current for that channel. Possible cause: the cable wire has been cut or disconnected from the output binding post.

- Calibrating An Industrial Model

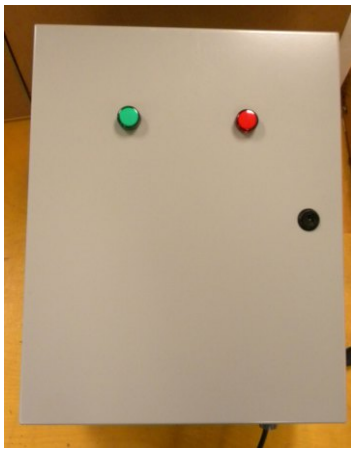
If a unit is ever disconnected and moved, the unit will need to be recalibrated. If the unit is unplugged and then plugged in at a later time – at the same location – no calibration will be required.

You can check to see if the unit is calibrated properly or if you need to calibrate a unit by following these directions:

- Calibrating The Industrial Unit To Match Coil / Pipe Variations

The unit has been factory calibrated to the pipe similar to that of the actual installed pipe. However there may be differences in the pipe material, pipe wall thickness, and coil wrapping techniques witch may require the unit to be re-calibrated. The following will instruct the installer on how to accomplish this task. Tools required, a large regular screw driver, and a small jewelers screw driver. **Note that even though the instructions are using different models to show the calibration process, the process is virtually identical for each model.**

Step 1) Make sure unit is at room temperature, **DO NOT** calibrate unit while the unit is warm. Please wait till the unit has returned to room temperature. Then, open the door on the unit using the large regular screw driver.

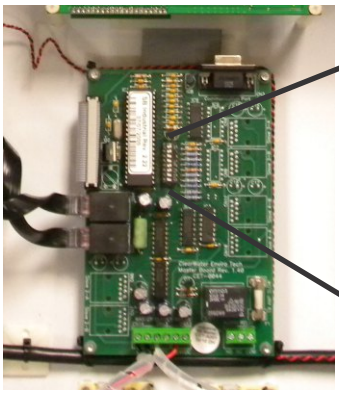


Control unit with door closed

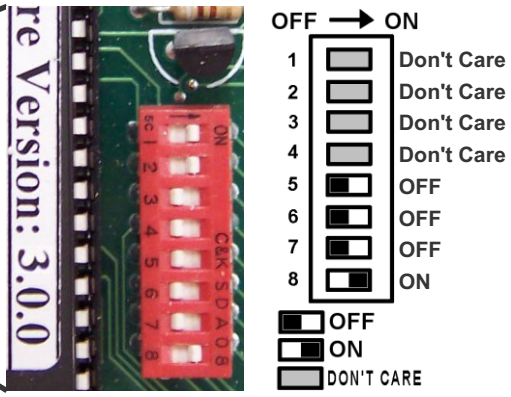
Control unit door open showing electronics inside

Step 2) Use the small jewelers screwdriver to move the bottom four dip switches to the positions shown in the picture below.

NOTE: DO NOT MOVE ANY OF THE TOP FOUR DIP SWITCHES.

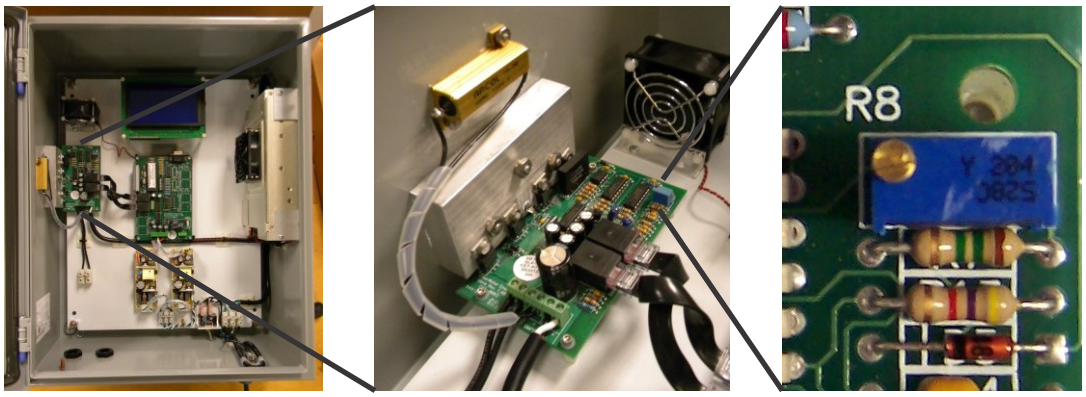


View of the master board showing location of the Dip Switch



Close up view of the Dip Switch set for calibration mode

Step 3) Locate the slave board, and the small blue potentiometer located at the upper right side of that board.

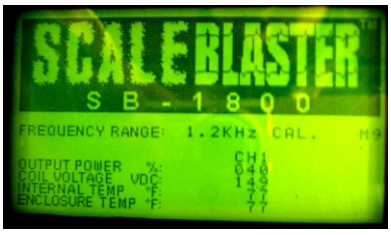


View showing all boards. | Close up view of slave board. | Close up view of potentiometer on slave board.

Step 4) With the coil attached, power up unit and notice that it now comes up in calibration mode (M9).

Step 5) Now that the unit is in calibration mode, the output power reading is changed in this mode to display the under/over current error trip point. This reading should be between 40 and 60. If output power is lower then 040, then using the small jewelers screwdriver, turn the small screw on the blue potentiometer clock wise, this will increase the output power reading. Likewise if the output power reading is more then say 060, adjust the potentiometer counterclockwise till it is between 40-60. Please note that the exact reading is not critical, and where from 40 to 60 will allow the unit to operate with in the normal operating parameters.

View of the units screen in normal mode (M4)

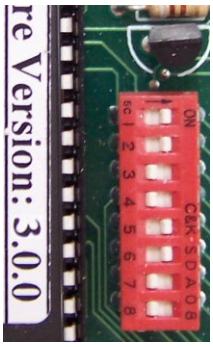


View of the units screen in calibration mode (M9)

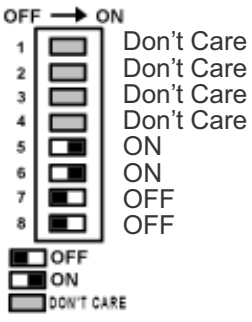
Note: If the unit is not responding to the above calibration then, turn the potentiometer **20 full turns counter-clockwise.** This will reset the unit to its default minimum value. Then repeat step 5.

Note: This will not increase the output power. This adjustment is for the internal microcontroller reference for sensing over and under current conditions and has nothing to due with normal operating output coil current.

Step 6) Once the adjustment has been made, power down unit and reset the bottom four dip switches back to the normal operating mode, 1KHz to 20KHz (M4).



View of the Dip Switch set for normal mode.



- Important Notice On Whether The Unit Was Calibrated Or Not

JUST BECAUSE THE COMPUTER READOUTS SAY THAT EVERYTHING IS READING FINE, THIS DOES NOT MEAN THE UNIT IS CALIBRATED.

You will have to go into the “calibrating mode” and check to see if the readout is between 40 and 60. If it is not, the unit is not properly calibrated and will not work properly. The normal readouts on the LCD indicator screen have no knowledge of the pipe size or type. You will have to go into the “calibrating mode” to view that.

To go into the calibration mode, you must have a “cool” circuit board to monitor it. In other words, if the unit was not plugged in, you should be fine to test it immediately. If the unit has been on, you will need to disconnect the unit and wait about 15 minutes for it to cool off. Then you can test for the calibration.

- Weather Effects On Calibrating

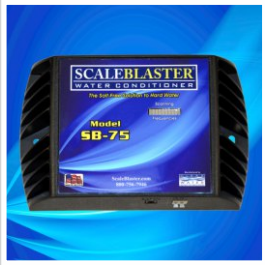
There is one major factor that may affect the calibration after it has been installed. A severe change in seasons – from going to desert hot of over 100 degrees F to sub-freezing may impact the calibration reading and it should be reset. We usually have to make these adjustments to the hundreds of units on power plants in China, where they are installed in the deserts and are subject to radical 150 degree changes of weather between summer and winter.

If the install is subject to radical changes in weather, we suggest enclosing the units in its own little shack or building, like this example in China. The building is actually heated because the temperatures can get to below 50 degrees F!

H. ScaleBlaster Applications

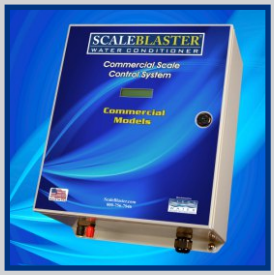
There are over a hundred applications that **ScaleBlaster,** an electronic water conditioner/ limescale remover will work on. We have several models of **ScaleBlaster** for the residential, commercial and industrial industries.

Residential



3 different models to handle any size house or water hardness

Commercial

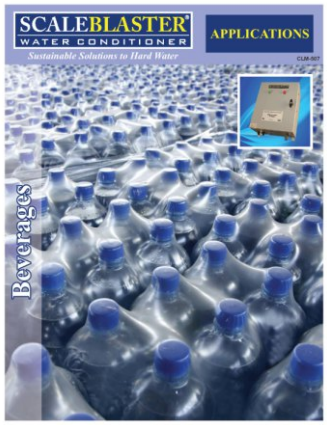


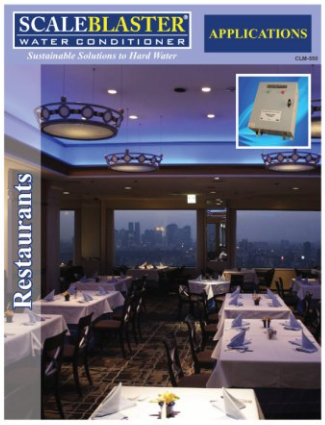
6 different models to handle pipe sizes up to 8"

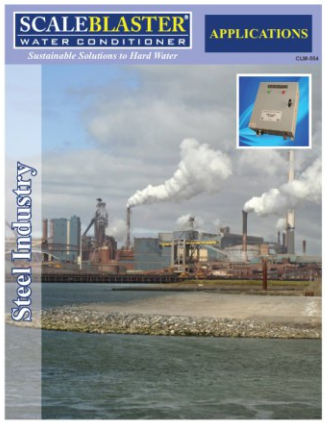
Industrial

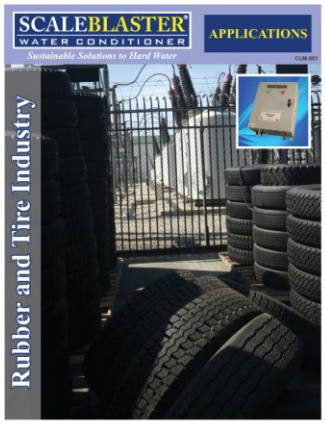
5 different models to handle pipe sizes up to 40"

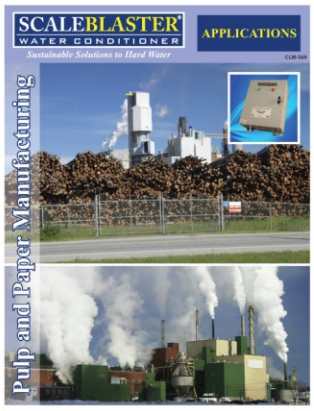
Here are some of the applications that ScaleBlaster will work on.





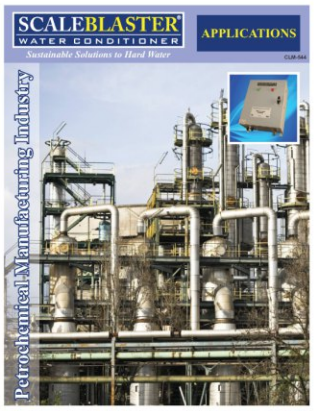


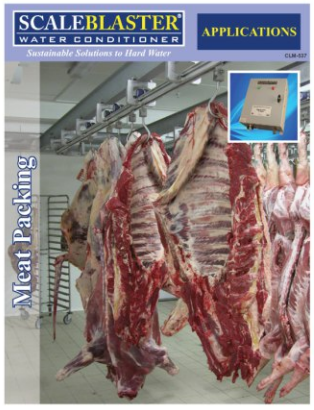



SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Pulp and Paper Manufacturing

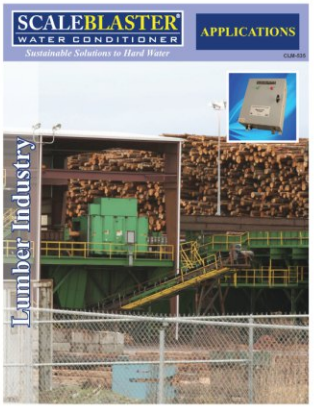

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Paint Manufacturing

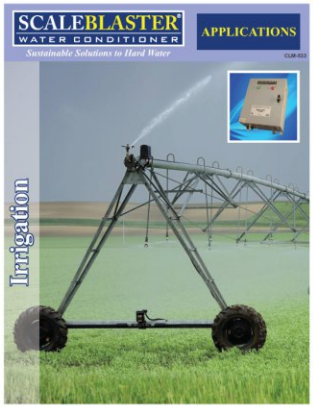

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Optical Industry


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Petrochemical Manufacturing Industry

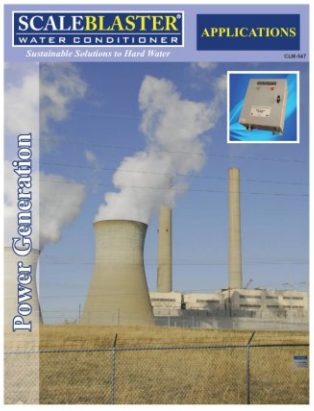

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Meat Packing


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Pharmaceutical Manufacturing

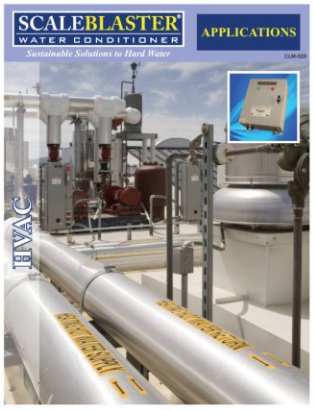

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Lumber Industry


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Irrigation

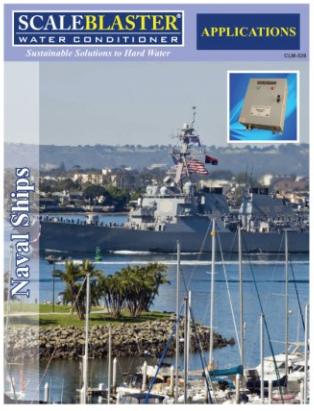

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Maritime Cargo Industry


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Power Generation


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Laundry and Dry Cleaning


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
HVAC

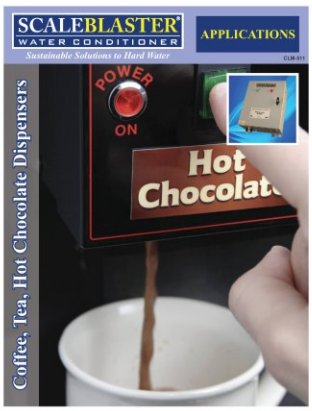

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Passenger Ships

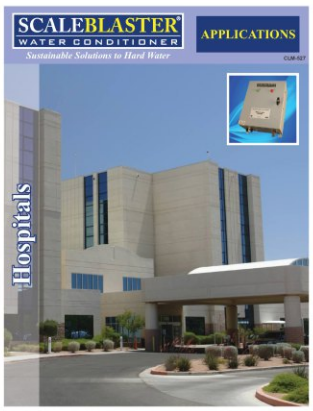

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Naval Ships


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Metal Casting & Milling


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Printing/Corrugated Boxes Industry

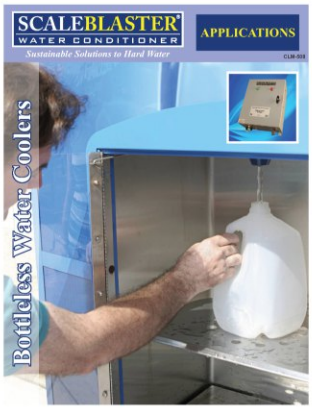

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Home, Office, Apartment & Condos


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
POWER
ON
Hot
Coffee, Tea, Hot Chocolate Dispensers


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Hospitals


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Environmental/Pollution Remediation


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Food Canning
Nutrition Facts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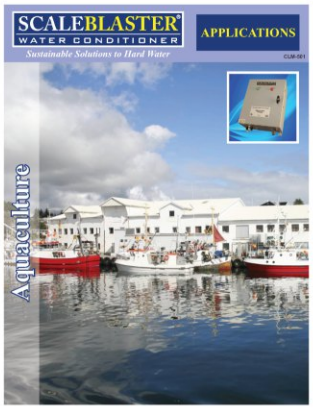
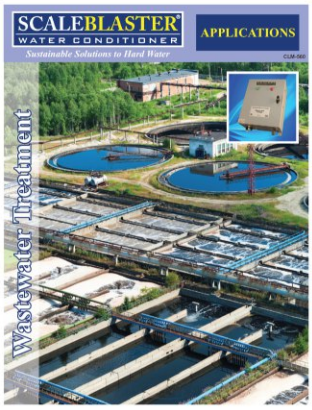
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Bottleless Water Coolers

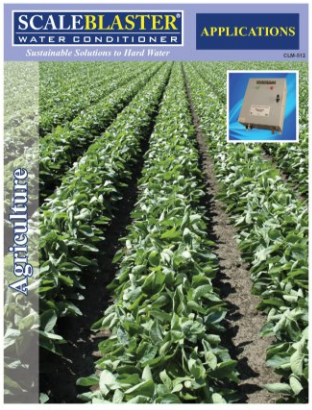

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Aquaculture

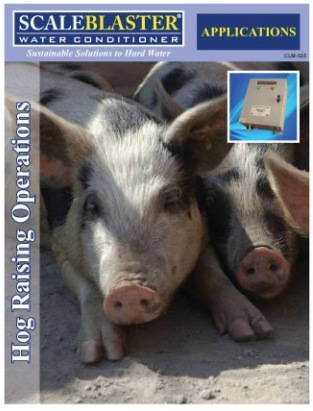

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Wastewater Treatment

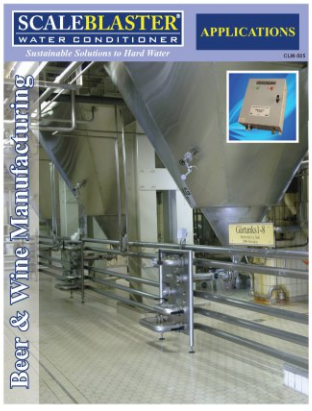

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Espresso Machines

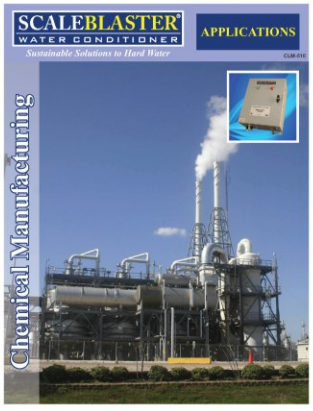

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Supermarkets

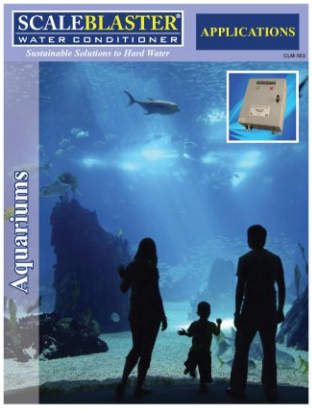

SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Bakeries


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Agriculture


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Hog Raising Operations


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Beer & Wine Manufacturing


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Chemical Manufacturing


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Aquariums


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Hotels / Motels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WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Dairy Farms


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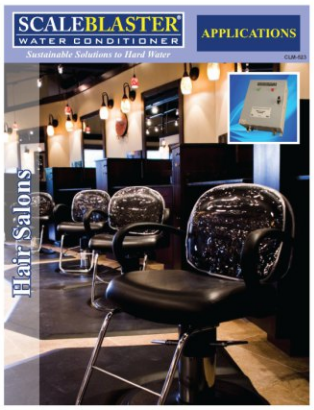
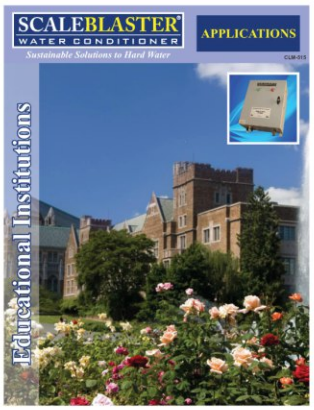
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Health Care Facilities


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Hair Salons


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Injection Molding


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Educational Institutions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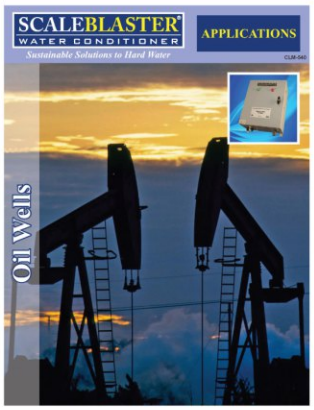
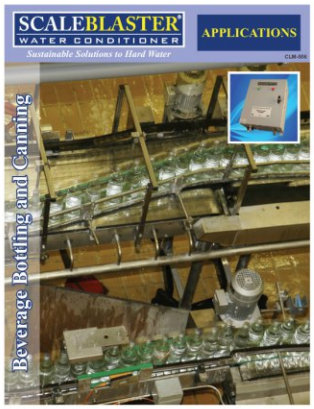
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Swimming Pools & Spas


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Oil Wells


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Beverage Bottling and Canning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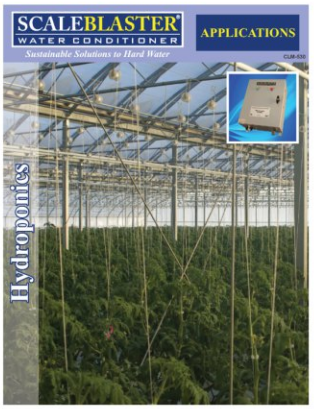
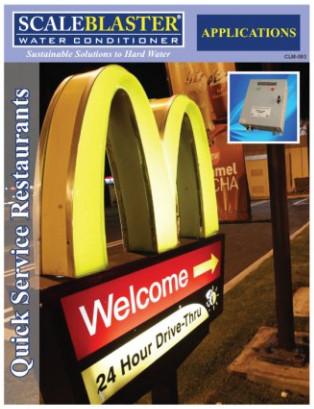
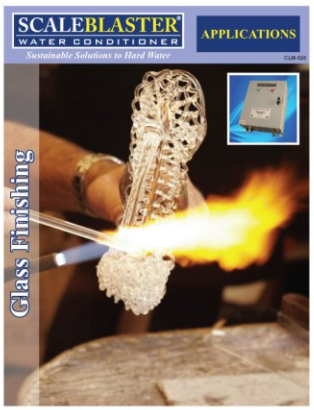
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Greenhouses


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Hydroponics


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Quick Service Restaurants
Welcome
24 Hour Drive-Thru


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Car Washes


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Glass Finishing


SCALEBLASTER
WATER CONDITIONER
APPLICATIONS
Sustainable Solutions to Hard Water
Fruit and Vegetable Processing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APPLICATIONS
Sustainable Solutions to Hard Water
Dye Manufacturing

SCALEBLASTER®
WATER CONDITIONER

The Sustainable Solution to Hard Water Problems

101

The Problem

The Result

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