Exhibit 5

OWT Ex. 2136
Tennant Company v. OWT
IPR2021-00625

ABOUT WATER OVERVIEW

The quality of the source water is critical when it comes to ionizer performance and protecting the performance of your investment over time. Let's face it, ionizers are not cheap; they represent one of the most important investments you will ever make in your health. Understanding the issue of water quality allows our IonWays customers to make informed choices.

The choice is clear - IonWays!

Ionization	Provides you the basics of the science of ionization
Water Quality	Directly addresses water quality issues.
Filtration	Addresses "clean water" in easy general terms
Well Water	Must read for those on well water

WATER 101

Water, The chemistry of life.

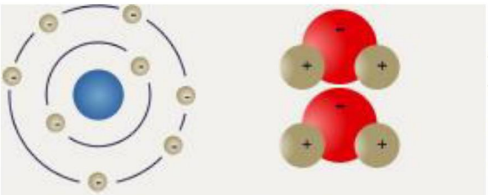
Whenever we attempt to determine whether there is life as we know it on Mars or other planets, scientists first seek to establish whether or not water is present. Why? Because life on earth totally depends on water.

A high percentage of living things, both plant and animal are found in water. All life on earth is thought to have arisen from water. The bodies of all living organisms are composed largely of water. About 70 to 90 percent of all organic matter is water.

The chemical reactions in all plants and animals that support life take place in a water medium. Water not only provides the medium to make these life sustaining reactions possible, but water itself is often an important reactant or product of these reactions. In short, the chemistry of life is water chemistry.

Water, the universal solvent

Water is a universal, superb solvent due to the marked polarity of the water molecule and its tendency to form hydrogen bonds with other molecules. One water molecule, expressed with the chemical symbol H2O, consists of 2 hydrogen atoms and 1 oxygen atom.



Standing alone, the hydrogen atom contains one positive proton at its core with one negative electron revolving around it in a three-dimensional shell. Oxygen, on the other hand, contains 8 protons in its nucleus with 8 electrons revolving around it.

This is often shown in chemical notation as the letter O surrounded by eight dots representing 4 sets of paired electrons.

The single hydrogen electron and the 8 electrons of oxygen are the key to the chemistry of life because this is where hydrogen and oxygen atoms combine to form a water molecule, or split to form ions.

Hydrogen tends to ionize by losing its single electron and form single H+ ions, which are simply isolated protons since the hydrogen atom contains no neutrons. A hydrogen bond occurs when the electron of a single hydrogen atom is shared with another electronegative atom such as oxygen that lacks an electron.

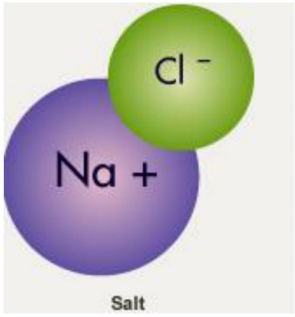
Polarity of water molecules

In a water molecule, two hydrogen atoms are covalently bonded to the oxygen atom. But because the oxygen atom is larger than the hydrogen's, its attraction for the hydrogen's electrons is correspondingly greater so the electrons are drawn closer into the shell of the larger oxygen atom and away from the hydrogen shells. This means that although the water molecule as a whole is stable, the greater mass of the oxygen nucleus tends to draw in all the electrons in the molecule including the shared hydrogen electrons giving the oxygen portion of the molecule a slight electronegative charge.

The shells of the hydrogen atoms, because their electrons are closer to the oxygen, take on a small electropositive charge. This means water molecules have a tendency to form weak bonds with water molecules because the oxygen end of the molecule is negative and the hydrogen ends are positive.

A hydrogen atom, while remaining covalently bonded to the oxygen of its own molecule, can form a weak bond with the oxygen of another molecule. Similarly, the oxygen end of a molecule can form a weak attachment with the hydrogen ends of other molecules. Because water molecules have this polarity, water is a continuous chemical entity.

These weak bonds play a crucial role in stabilizing the shape of many of the large molecules found in living matter. Because these bonds are weak, they are readily broken and re-formed during normal physiological reactions. The disassembly and re-arrangement of such weak bonds is in essence the chemistry of life.

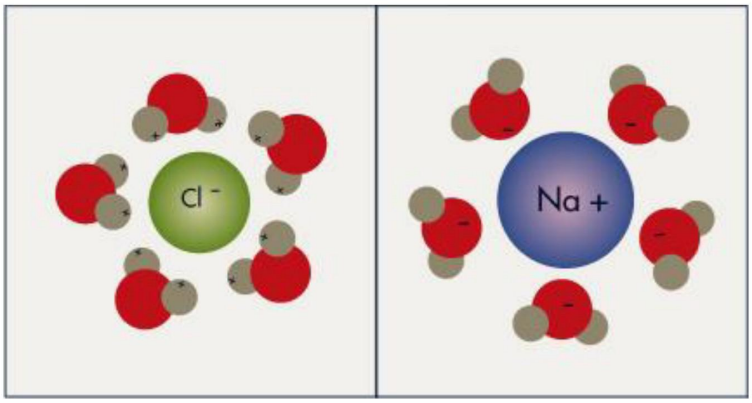


Salt

To illustrate water's ability to break down other substances, consider the simple example of putting a small amount of table salt in a glass of tap water. With dry salt (NaCl) the attraction between the electropositive sodium (Na+) and electronegative chlorine (Cl-) atoms of salt is very strong until it is placed in water.

After salt is placed in water, the attraction of the electronegative oxygen of the water molecule for the positively charged sodium ions, and the similar attraction of the electropositive hydrogen ends of the water molecule for the negatively charged chloride ions, are greater than the mutual attraction between the outnumbered Na+ and Cl- ions. In water the ionic bonds of the sodium chloride molecule are broken easily because of the competitive action of the numerous water molecules.

As we can see from this simple example, even the delicate configuration of individual water molecules enables them to break relatively stronger bonds by converging on them. This is why we call water the universal solvent. It is a natural solution that breaks the bonds of larger, more complex molecules. This is the chemistry of life on earth, in water and on land.



OXIDATION

The term reduction refers to the addition of an electron (e-); conversely, the term oxidation refers to the removal of an electron. In the process of reduction, the addition of an electron results in stored energy in the reduced compound. In the process of oxidation, the removal of an electron liberates energy from the oxidized compound. Whenever one substance is reduced, another is oxidized.

For clarification, consider the following example of two molecules, A and B.

When molecules A and B come into contact, here is what happens:

1. B grabs an electron from molecule A.
2. Molecule A has been oxidized because it has lost an electron.
3. The charge of B has been reduced because it has gained a negative electron (e-).

In biological systems, removal or addition of an electron constitutes the most frequent mechanism of oxidation-reduction reactions. These oxidation-reduction reactions are frequently called redox reactions.

pH ACIDS & BASES

An acid is a substance that increases the concentration of hydrogen ions (H+) in water. A base is a substance that decreases the concentration of hydrogen ions, in other words, increasing the concentration of hydroxide ions OH-.

The degree of acidity or alkalinity of a solution is measured in terms of a value known as pH, which is the negative logarithm of the concentration of hydrogen ions:

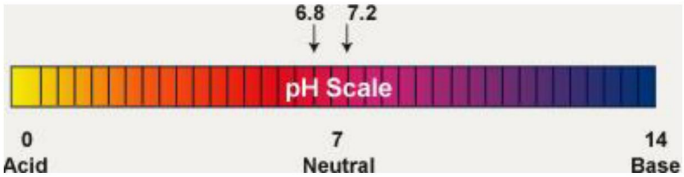
$$pH = \log[1/H+] = -\log[H+]$$

What is pH?

On the pH scale, which ranges from 0 on the acidic end to 14 on the alkaline end, a solution is neutral if its pH is 7. At pH 7, water contains equal concentrations of H+ and OH- ions. Substances with a pH less than 7 are acidic because they contain a higher concentration of H+ ions. Substances with a pH higher than 7 are alkaline because they contain a higher concentration of OH- than H+. The pH scale is a log scale so a change of one pH unit means a tenfold change in the concentration of hydrogen ions.

Importance of balancing pH

Living things are extremely sensitive to pH and function best (with certain exceptions, such as certain portions of the digestive tract) when solutions are nearly neutral. Most interior living matter (excluding the cell nucleus) has a pH of about 6.8.



Blood plasma and other fluids that surround the cells in the body have a pH of 7.2 to 7.3. Numerous special mechanisms aid in stabilizing these fluids so that cells will not be subject to appreciable fluctuations in pH. Substances which serve as mechanisms to stabilize pH are called buffers. Buffers have the capacity to bond ions and remove them from solution whenever their concentration begins to rise. Conversely, buffers can release ions whenever their concentration begins to fall. Buffers thus help to minimize the fluctuations in pH. This is an important function because many biochemical reactions normally occurring in living organisms either release or use up ions.

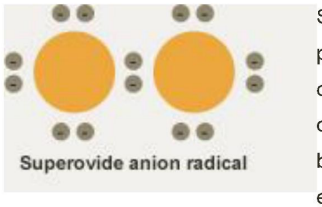
NOTE: Dr. Hayashi is a Heart Specialist and Director of the Water Institute of Japan.

OXYGEN & FREE RADICALS

Oxygen: Too much of a good thing?

Oxygen is essential to survival. It is relatively stable in the air, but when too much is absorbed into the body it can become active and unstable and has a tendency to attach itself to any biological molecule, including molecules of healthy cells. The chemical activity of these free radicals is due to one or more pairs of unpaired electrons.

About 2% of the oxygen we normally breathe becomes active oxygen, and this amount increases to approximately 20% with aerobic exercise.



Such free radicals with unpaired electrons are unstable and have a high oxidation potential, which means they are capable of stealing electrons from other cells. This chemical mechanism is very useful in disinfectants such as hydrogen peroxide and ozone which can be used to sterilize wounds or medical instruments. Inside the body these free radicals are of great benefit due to their ability to attack and eliminate bacteria, viruses and other waste products.

Active Oxygen in the body

Problems arise, however, when too many of these free radicals are turned loose in the body where they can also damage normal tissue.

Putrefaction sets in when microbes in the air invade the proteins, peptides, and amino acids of eggs, fish and meat. The result is an array of unpleasant substances such as:

- Hydrogen sulfide
- Ammonia
- Histamines
- Indoles
- Phenols
- Scatoles

These substances are also produced naturally in the digestive tract when we digest food, resulting in the unpleasant odor evidenced in feces. Putrefaction of spoiled food is caused by microbes in the air; this natural process is duplicated in the digestive tract by intestinal microbes. All these waste products of digestion are pathogenic, that is, they can cause disease in the body.

Hydrogen sulfide and ammonia are tissue toxins that can damage the liver. Histamines contribute to allergic disorders such as atopic dermatitis, urticaria (hives) and asthma. Indoles and phenols are considered carcinogenic. Because waste products such as hydrogen sulfide, ammonia, histamines, phenols and indoles are toxic, the body's defense mechanisms try to eliminate them by releasing neutrophils (a type of leukocyte, or white corpuscle). These neutrophils produce active oxygen, oddball oxygen molecules that are capable of scavenging disintegrating tissues by gathering electrons from the molecules of toxic cells.

When too many active oxygen molecules, or free radicals, are produced in the body they become reactive and can attach themselves to normal, healthy cells and cause damage by stealing electrons from normal, healthy biological molecules. This electron theft by active oxygen oxidizes tissue and can cause disease.

Effect of Oxidation on Vital Organs	
Oxidated Tissue	**Leads to:**
Liver	Hepatitis, cirrhosis, cancer
Pancreas	Pancreatitis, diabetes, cancer
Kidney	Nephritis, nephrosis, cancer

Because active oxygen can damage normal tissue, it is essential to scavenge this active oxygen from the body before

it can cause disintegration of healthy tissue. If we can find an effective method to block the oxidation of healthy tissue by active oxygen, then we can attempt to prevent disease.

Hydrogen sulfide, amonia, histamines, indoles, phenoles, and scatoles present in the digestive tract of the human body.

In order to protect the body from damage by hydrogen sulfide, amonia, histamines, indoels, phenoles and scatoles, neutrophils (leukocytes) produce active oxygen to oxidize these waste products

ANTIOXIDANTS

One way to protect healthy tissue from the ravages of oxidation caused by active oxygen is to provide free electrons to active oxygen radicals, thus neutralizing their high oxidation potential and preventing them from reacting with healthy tissue.

Research on the link between diet and cancer is far from complete, but some evidence indicates that what we eat may affect our susceptibility to cancer. Some foods seem to help defend against cancer, others appear to promote it.

Much of the damage caused by carcinogenic substances in food may come about because of an oxidation reaction in the cell. In this process, an oddball oxygen molecule may damage the genetic code of the cell. Some researchers believe that certain natural substances known to prevent oxidation -- called ANTIOXIDANTS -- can block the damage. Moreover, it is believed that the intake of natural antioxidants could be an important aspect of the body's defense against cancer. Substances believed to inhibit cancer growth include vitamin C, vitamin E, beta-carotene, selenium, and glutathione (an amino acid). These substances are reducing agents which supply electrons to free radicals, thus blocking the interaction of the free radical with normal tissue.

Active Oxygen in the body

While natural antioxidants such as vitamin C, vitamin E, beta-carotene are important to a healthy and balanced diet, there is an even better source of free electrons: Alkaline, Ionized Water.

Water treated by electrolysis to increase its reduction potential is the best solution to the problem of providing a safe source of free electrons to block the oxidation of normal tissue by free oxygen radicals. Reduced water – alkaline, ionized water - with an excess of free electrons to donate to active oxygen, is the most effective solution because its lower molecular weight allows the electrons to reach all tissues of the body in a very short time.

IONIZED WATER

Ionized water is the product of mild electrolysis which takes place in the ionized water unit. The production of ionized water, its properties, and how it works in the human body are described in the next section. Ionized water is treated tap water that has been filtered and reformed to create reduced water with a large mass of electrons that can be donated to active oxygen in the body to block the oxidation of normal cells.

THE IONIZED WATER UNIT

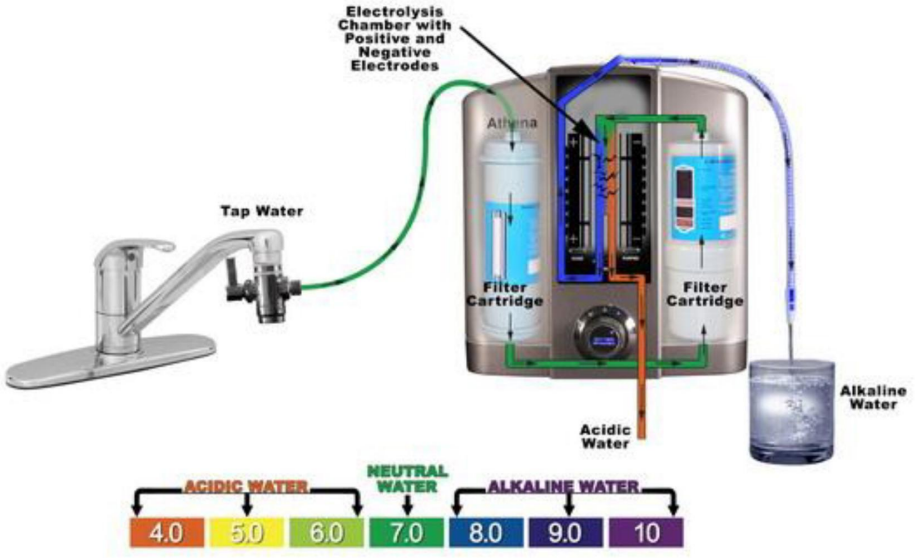
Redox Potential

Normal tap water, for example, with a pH of 7 is approximately neutral on the pH scale of 0 to 14. When measured with an ORP (oxidation potential) meter its redox potential is approximately +400 to +500 mV. Because it has a positive redox potential, it is apt to acquire electrons and oxidize other molecules. Reduced Ionized Water, on the other hand, has a negative redox potential of approximately -250 to -350 mV. This means it has a large mass of electrons ready to donate to electron-thieving active oxygen.

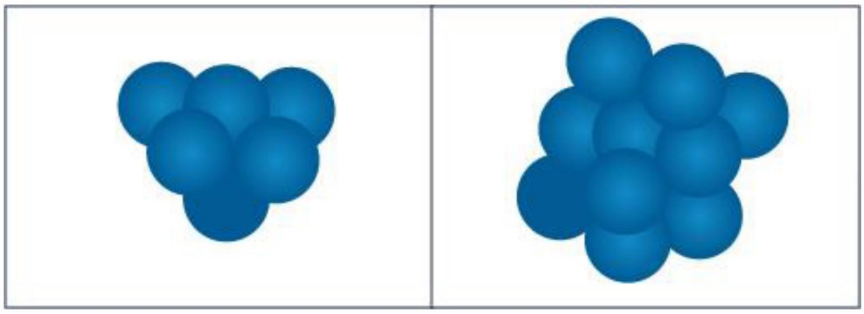
Before discussing the properties of Ionized Water further, let's take a look at what happens inside an Ionized Water producing unit.

How an IONIZED WATER Unit works

The Ionized Water unit, slightly taller and thicker than a large dictionary on end, is an electrical appliance connected to your kitchen water supply to perform electrolysis on tap water before you drink it or use it in the kitchen for cooking or cleaning.



A special attachment re-directs tap water out of the faucet through a plastic hose into the Ionized Water unit. Inside the Ionized Water unit, the water is first filtered through activated charcoal. Next, the filtered water passes into an electrolysis chamber equipped with a platinum-coated titanium electrode where electrolysis takes place.



Cations, positive ions, gather at the negative electrodes to create cathodic water (reduced water). Anions, negatively charged ions, gather at the positive electrode to make anodic water (oxidized water).

Through electrolysis, reduced water not only gains an excess amount of electrons (e-), but the cluster of H 2O seem to be reduced in size from about 10 to 13 molecules per cluster to 5 to 6 molecules per cluster.

The reduced water comes out of the faucet, and the oxidized water comes out of a separate hose leading into the sink. You can use the reduced water for drinking or cooking. The oxidation potential of the oxidized water makes it a good sterilizing agent, ideal for washing hands, cleaning food or kitchen utensils, and treating minor wounds.

What the IONIZED WATER Unit Produces

Redox potential comparison

After electrolysis of the water inside the Ionized Water unit, reduced water comes out of the cathodic side and oxidized water comes out of the anodic side. Compare these measurements of these three types of water: tap water before electrolysis, the reduced water, and the oxidized water.

Reduction-oxidation (redox) potential			
Water Type	**Leads to:**	**pH**	**What it Means**
Tap Water	+400 to +500mV	7	Slight oxidation potential
Reduced Water	-250 to -350mV	8	Strong reduction potential contains a mass of electrons that can be donated to free radicals.
Oxidated Water	+700 to +800mV	4	Strong oxidation potential, a shortage of electrons giving it the ability to oxidize and sterilize.

ANTIOXIDANT POTENTIAL

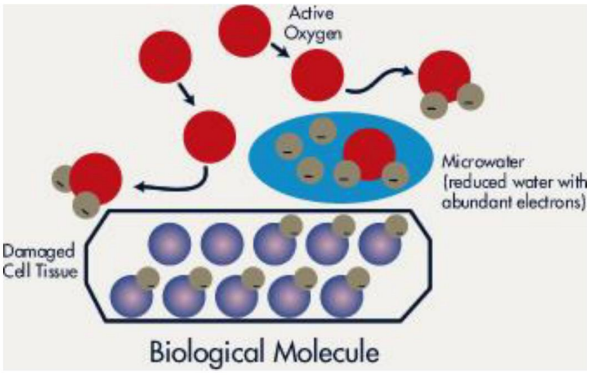
Redox potential, not pH, is the crucial factor

Traditionally we have judged the properties of water from the standpoint of pH, in other words whether water is acidic or alkaline. According to Dr. Yoshiaki Matsuo PhD., the inventor of the Ionized Water unit, "In my opinion, redox potential is more important than pH. The importance of pH is over emphasized. For example, the average pH of blood is 7.4 and acidosis or alkalosis is defined according to deviation within the range of 7.4 +- 0.005. But nothing has been discussed about ORP, or oxidation-reduction potential."

The pH of tap water is about pH 7, or neutral. When tap water is electrolyzed into Ionized Water, its reduced water has a pH of about 9 and the oxidized water a pH of about 4. Even if you make alkaline water of pH 9 by adding sodium hydroxide or make acidic water of pH 3 by adding hydrogen chloride, you will find very little change in the ORP values of the two waters. On the other hand, when you divide tap water with electrolysis you can see the ORP fluctuate by as much as +- 1,000 mV. By electrolysis we can obtain reduced water with negative potential that is good for the body.

USING IONIZED WATER

What IONIZED WATER Does



The Ionized Water unit produces two kinds of water with different redox potentials, one with a high reduction potential and the other with a high oxidation potential.

Reduced Water

When taken internally, the reduced Ionized Water with its redox potential of -250 to -350 mV readily donates its electrons to oddball oxygen radicals and blocks the interaction of the active oxygen with normal molecules.

A biological molecule (BM) remains intact and undamaged.

Undamaged biological molecules are less susceptible to infection and disease. Ionized Water gives up an extra electron and reduces the active oxygen (AO), thus rendering it harmless. The AO is reduced without damaging surrounding biological molecules. Substances which have the ability to counteract active oxygen by supplying electrons are called scavengers. Reduced water, therefore, can be called scavenging water.

When taken internally, the effects of reduced water are immediate. Ionized Water inhibits excessive fermentation in the digestive tract by reducing indirectly metabolites such as hydrogen sulfide, ammonia, histamines, indoles, phenols and scatoles, resulting in a cleaner stool within days after reduced water is taken on a regular basis. **In 1965, the Ministry of Welfare of Japan announced that reduced water obtained from electrolysis can prevent abnormal fermentation of intestinal microbes.**

Oxidized Water

Oxidized water with its redox potential of +700 to +800 mV is an oxidizing agent that can withdraw electrons from bacteria and kill them. The oxidized water from the Ionized Water unit can be used to clean hands, kitchen utensils, fresh vegetables and fruits, and to sterilize cutting boards and minor wounds. Tests have shown that oxidized water can be used effectively to treat athlete's foot, minor burns, insect bites, scratches, and so on.

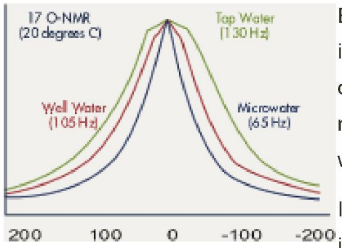
Dr. Yoshiaki Matsuo, Vice Director of the Water Institute of Japan, has developed another apparatus capable of producing hyperoxidized water with a redox potential of +1,050 mV or more, and a pH lower than 2.7. Tests have shown that this hyper oxidized water can quickly destroy MRSA (Methecillin Resistant Staphylococcus Aureus).

Although hyperoxidized water is a powerful sterilizing agent, it won't harm the skin. In fact, it can be used to heal. Hyperoxidized water has proven effective in Japanese hospitals in the treatment of bedsores and operative wounds with complicated infections.

But perhaps the most exciting future application of hyperoxidized water is in the field of agriculture where it has been used effectively on plants to kill fungi and other plant diseases. Hyperoxidized water is non-toxic, so agricultural workers can apply it without wearing special protective equipment because there is no danger of skin or respiratory damage. An added benefit of using hyperoxidized water to spray plants is that there is no danger to the environment caused by the accumulation of toxic chemicals in the ground.

Ionized Water superior to antioxidant diet

Today we read much about correct dieting principles and paying attention to what we eat in order to stay healthy. This is a sensible practice, but it is surprising that many of us don't realize that the bulk of what eat is composed of water. Vegetables and fruits are 90% water; fish and meat are about 70% water as well.



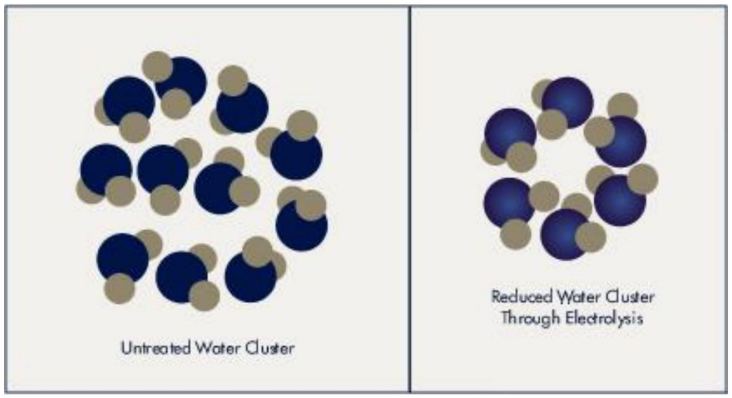
Even advocates of the importance of vitamin C in diet staples have to admit that its potency, namely, the redox potential of this important vitamin, rapidly diminishes with age and preparation for the dining table. A carbohydrate, the main constituent of vegetables and fruit, has a molecular weight of 180 whereas water has a much lower molecular weight of 18.

Ionized Water, with its low molecular weight and high reduction potential, makes it a superior scavenging agent of active oxygen. But electrolysis inside the Ionized Water unit not only charges the reduced water with electrons, it also reduces the size of reduced water molecule clusters.

NMR (Nuclear Magnetic Resonance) analysis reveals that tap water and well water consists of clusters of 10 to 13 H2 0 molecules. Electrolysis of water in the Ionized Water unit reduces these clusters to about half their normal size -- 5 to 6 water molecules per cluster.

Substances	Leads to:
Tap Water	18
Beta-carotene	150
Vitamin E	153
Vitamin C	176

As the graph above shows, the NMR signal that measures cluster size by line width at half-amplitude shows 65 Hz for reduced water and 133 Hz for tap water, revealing that the reduced water clusters are approximately half the size of tap water clusters.



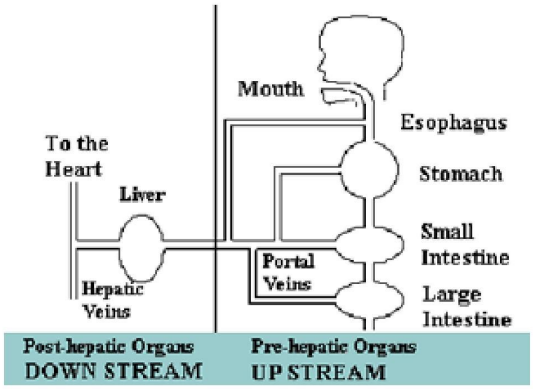
This is why Ionized Water is more readily absorbed by the body than untreated tap water. Ionized Water quickly permeates the body and blocks the oxidation of biological molecules by donating its abundant electrons to active oxygen, enabling biological molecules to replace themselves naturally without damage caused by oxidation that can cause diseases.

SUMMARY AND CONCLUSIONS

Upstream and downstream theory

Prevent disease at the source

According to Dr. Hidemitsu Hayashi, Director of the Water Institute of Japan, "To eliminate the pollutants in a large stream that is contaminated at its source, we must work on the problems upstream at the headwaters -- the source of the pollution -- not downstream where we can only try to treat the evidence of damage caused by the pollution. Ionized Water's contribution to preventive medicine is essentially upstream treatment."



Upstream

According to our model, we consider the digestive tract upstream where we intake water and food. Although many people today in developed countries are growing more skeptical about what they eat, they tend to concentrate more on what the food contains rather than the metabolized products of foods in the digestive tract.

Reduced water indirectly reduces hydrogen sulfide, ammonia, histamines, indoles, phenoles, and scatoles and changes them into harmless substances

Defacation of cleaner stools.

For example, consider the typical balanced diet of meat and vegetables. Meat protein is metabolized into amines while nitrates from fertilizers used to grow vegetables metabolize into nitrites in the digestive tract. These amines and nitrites combine to form nitrosamine, a recognized carcinogen.

We've already discussed that odoriferous feces are evidence of excessive fermentation in the digestive tract, so reduced water performs a very important function upstream in the digestive tract by reducing this excessive fermentation as evidenced by cleaner stools within days of starting a steady regimen of reduced water.

Downstream

Reduced water indirectly reduces hydrogen sulfide, ammonia, histamines, indoles, phenoles, and scatoles and changes them into harmless substances

Defacation of cleaner stools.

Downstream from the digestive tract, starting at the liver, reduced water quickly enters the liver and other organs due to, first, its lower molecular weight, and, secondly, the size of its clusters. At tissue sites throughout the body, reduced water with its safe, yet potent reduction potential readily donates its passenger electrons freely to active oxygen and neutralizes them so they cannot damage the molecules of healthy cells. Normal cells are protected from the electron thievery of active oxygen and allowed to grow, mature, function and regenerate without interference from rogue, oddball oxygen radicals which tend to steal the electrons from the molecules of normal, healthy biological molecules.

The water boom

We are now in the midst of a water boom. In Japan and other countries consumers are buying various kinds of bottled and canned water even though water is one of our most abundant vital resources. Research data reveals that mineral waters have an ORP of +200 mV, slightly lower than the +400 mV measured for ordinary tap water. We can say that at least mineral water is marginally better than tap water from the viewpoint of ORP. Compared to any processed water for sale, however, Ionized Water with its reduction potential of -250 to -300 mV is beyond comparison due to its ability to scavenge active oxygen radicals.

WATER QUALITY

Some companies will sell you an ionizer regardless of your water quality situation. IonWays has drafted the following information and guidelines to help you understand the role water quality plays in ionizer performance and longevity. From this perspective, you will be better able to make an informed investment in an ionizer and your health.

Most people think water is just plain old H2O and is the same regardless of where it comes from - whether from a bottle, tap or well. The truth is water quality varies widely throughout North America and this variation has a significant impact on the performance and longevity of your ionizer. The variation in water depends on many factors. There are two basic causes of variation - natural environmental factors and contaminants caused by man.

Contaminants are usually man-made, but not in all cases, as there are also naturally occurring contaminants. A main influence on the type and concentration of contaminants is how close the water is to population centers, industry, livestock and/or agricultural operations etc.

Natural causes of changes in water quality are mainly due to the source of the water supply. Some examples of common water sources are aquifers, rivers, reservoirs, run-off, wells, springs etc. These variations in source contribute to the difference of the mineral content in water. These variables cause water to have very different properties, such as taste and smell or to "behave" or perform differently around the house, especially in an ionizing unit.

As the popularity of ionizers continues to dramatically expand, we at IonWays are gaining experience in dealing with the wide variability of water quality. IonWays is committed to work with our customers to provide the solutions required before and after the sale.

The Scaling Effect of Hard and Soft Water

One dramatic variation in water found across the US is the mineral content. Depending upon the geological conditions, the source of water (groundwater/wells or surface water/rivers & lakes) and other factors, the amount of minerals found in water differ significantly. The variability in mineral content is described as "hard" or "soft" waters. Hard water has a high concentration of minerals. Soft water is low in mineral content.

If you live in a hard water area you know it is more difficult to form lather with soap while bathing or performing ordinary household chores. Perhaps you have on occasion noticed mineral deposits on your cooking dishes, or rings of insoluble soap scum in your bathtub. These are not necessarily signs of poor housekeeping, but are rather signs of hard water. Hard water is water that contains high levels of calcium, iron or magnesium mineral ions. These minerals do not pose any health threat, unless in very high amounts, but they can engage in reactions that leave insoluble mineral deposits.

Hard water mineral deposits or "scaling", is the precipitation of minerals which form lime scale. Scale can clog pipes and can decrease the life of virtually all appliances in the home, especially those that use hot water. It can coat the inside of tea and coffee pots, and clog and ruin water heaters - and of course do the same thing to your ionizer decreasing performance and longevity caused by the build up of scale on the plates inside the ionization chamber and internal tubing. As scale builds up inside the chamber, the strength of ionization is diminished. Clogged tubing can lead to decreased water flow.

Very soft water (which is acidic) can corrode the metal pipes in which it is carried and as a result the water may contain elevated levels of cadmium, copper, lead and zinc.

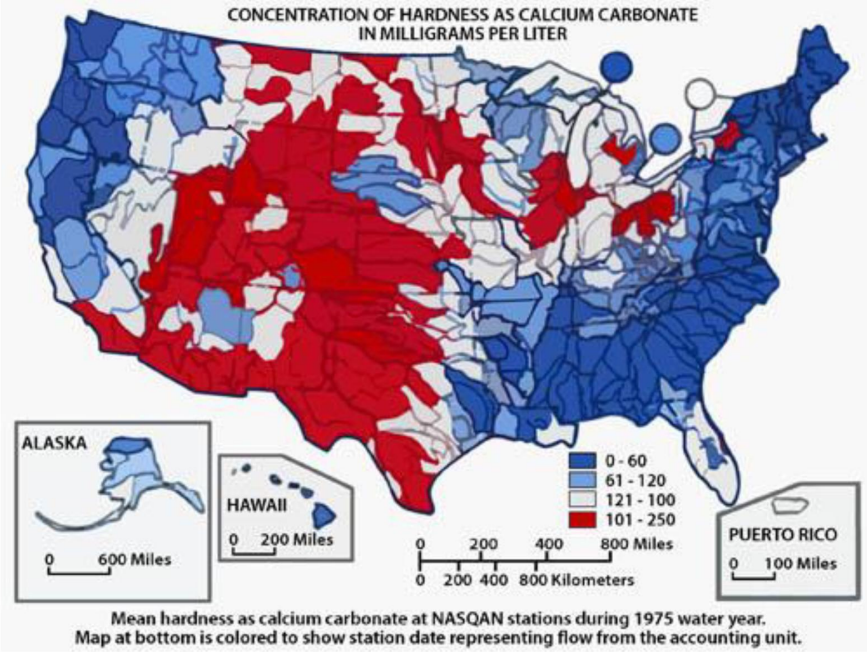
Hard and Soft Water and Ionizer Performance

An ionizer requires mineral content to operate. It is the minerals which carry the electrical charge that produces the alterations found in ionized water. Water that has little or no minerals, such as reverse osmosis or distilled water has no pathway for the electrolysis or "ionization" to occur. It is important to note that all water found in nature has dissolved mineral content, so these types of "pure" water are a man-made phenomenon. Our bodies are made to drink water with minerals, not pure, mineral free bottled water. Calcium, potassium and magnesium minerals in natural water are called the "essential alkalizing minerals" as they are essential to our health.

The more mineral content your water has, the more easily your ionizer will alter the water and the better performance measurements you see. The less mineral content, the harder it is for your ionizer to create alteration in your water and the weaker performance you will see. In simple terms an ionizer will perform better with mineral rich or hard water and will have a harder time with softer water, or water low in mineral content. Ionizers are designed to perform optimally within certain water quality parameters; too many minerals may damage any ionizer, too few you may experience decreased performance.

Hard water in the US

According to the United States Geological Survey, 85% of US homes have some level of hardness in the water. In most areas the level of hardness is acceptable for ionizers. The areas of US shown in red on the map below will generally have the highest levels of hardness. Ionizers will perform very well in most of these areas. However, be aware that there are isolated pockets in Arizona, Southern California, Texas, Utah, New Mexico and the mid west and in well water sources all over the US that have extreme hard water, which can cause ionizer malfunction and/or long term damage. Please see the "Water Quality Requirements" section below for specifics.



Mean hardness as calcium carbonate at NASQAN stations during 1975 water year.
Map at bottom is colored to show station date representing flow from the accounting unit.

NOTE: The above map is only to be used as an approximation and used to gain a general understanding of the water quality with respect to hardness of a given geographic area. The measurements in any area can be higher or lower, especially if you are on well water.

The softest water occurs in parts of New England, South Atlantic-Gulf, Pacific Northwest, and Hawaii regions. It is important to note that these are generalities; you can find well water sources in soft water areas that have very hard water and conversely, you can find soft water in hard water areas.

Water Quality Requirements

Source water in most areas of North America measures somewhere between the two extremes specified below, thus allowing for good ionizer performance and longevity. In cases of extreme water quality, contact your IonWays Associate first to inquire about possible solutions. If there is not an easy solution, IonWays Technical Support will always work with you to determine a course of action.

Extreme Hardness

IonWays does not recommend using an ionizer without pretreatment of water that has one or more of the following measurements:

- Hardness (or Calcium Carbonate) over 150ppm (8.5 grains)
- Iron over .3ppm
- TDS below 40ppm or over 600ppm
- Calcium above 50ppm

Note: some reports will show "ppm" some will show "mg/l" - they are the same. Knowingly operating your ionizer above these levels may void your warranty and/or decrease your ionizer's performance.

Pre- treatment options are:

- Hardness < 50ppm = Calcium Inserts or Remineralization Filter (different styles available).
- 51ppm < Hardness > 120ppm = New & Improved BioStone Plus Filter.
- 121ppm < Hardness > 180ppm = EOS Mark II Anti Scaling Device or Spartan Ionizer Shield for Hard Water, depending on concentrations of other contaminants.
- 181ppm < Hardness > 250ppm = Spartan Ionizer Shield for Hard Water .
- 251pm < Hardness > 425ppm = Water Softener + R/O System w/ Remineralizer.
- 426 < Hardness = Please contact IonWays Technical Support for additional information.

Softeners

IonWays does not recommend using an ionizer downstream (or after) sodium based ion- exchange water softeners. Potassium based ion-exchange softened water is acceptable, but be advised your water will be calcium and magnesium free. If you have a sodium ion-exchange softener, you will need to do one of the following:

- Bypass the system (if the source water meets the above Water Quality criteria)
- Change the plumbing connectors and install the softener on the hot water only
- Install a Reverse Osmosis unit and Remineralization Cartridge

Reverse Osmosis (RO) and Distillers

Ionizers will not work downstream (or after) a RO or distiller. Many homes with an ion-exchange softening system will have an RO system. These systems remove virtually all the mineral content and leave the water with no conductivity. If you have an RO or distiller, you will need to do one of the following:

- Bypass the system (if the source water meets the above Water Quality criteria)
- Install a Remineralization Cartridge after the RO system

Extreme Softness

'Soft' water is very low in mineral and dissolved solid content which gives water its conductivity. Such water would have the following measurements:

- TDS below 40ppm

In areas with extremely soft water (or if using a rainwater catchment system), it may not be possible to achieve optimal performance of your Ion Ways system. In this situation, a Remineralization Cartridge is recommended. IonWays has incorporated a proprietary blend of organic and inorganic minerals into its Remineralizer.

Well Water

- In addition to measurements of water quality for ionization performance and longevity, health safety related issues are also important considerations when using well water. Well water tests can help to determine water quality; please refer to "The Well Water Memorandum" in your IonWays back office.
- Many states require a well water test report in the closing documents of a home sale. Many local governmental Health Agencies offer free testing of well water. We recommend contacting them first.

Chloramine

Many municipal water systems have started using chloramines, rather than chlorine, in the water treatment process. The BioStone Filtration System, featuring a unique combination of media specifically designed for ultimate chlorine and chloramines filtration, is the best counter top filtration system on the market.

Important Notes:

- Please contact your IonWays Associate if your water falls into any one of the above categories. If your situation requires additional technical assistance, IonWays Technical Support will work with you to find a solution.
- If your water is within 10% of two or more of the Extreme Hardness categories, you could possibly experience performance issues with your ionizer. You may require pretreatment. Please contact Technical Support for guidance.
- If you are uncertain of the water quality in your area, please contact your local water supplier and request the specific Water Quality information above. The appropriate phone number will be on your water bill. If using well water, contact your county or state health dept to inquire about water testing services.

FILTRATION

Understanding Water Contaminants, Filtration and Ionizers

It seems like we are continuously confronted in the news media with stories on water quality and contamination, most recently an Associated Press report that concluded pharmaceuticals are now found in drinking water in cities all across the United States. As the quality of water becomes more and more suspect and our ability to detect contaminants increases, the issue of clean water will be become a paramount health issue. Understanding this issue more fully can make a world of difference to your health!

Your Ion Ways water ionizer is designed to give you decades of optimal performance. To ensure that your ionizer performs up to its true potential, it is important to develop an understanding of water quality in order to get the most out of your ionizer and protect the investment you made in it. This document is designed to give new as well as "experienced" Ion Ways water consumers' solid understanding of how water filtration and ionization can work together to create clean and healthy water.

Water's Amazing Properties

A water molecule is one of the most unique elements on the planet. It has an incredible ability to absorb virtually anything it comes in contact with. Actually, if water was any more absorbing it would be virtually impossible to capture, store, transport and treat.

Water's amazing ability to absorb applies to elements it contacts physically. This absorptive capability provides all of the healthy natural occurring minerals found in good/clean water sources, but can also lead to the accumulation of dangerous, life-threatening compounds as well. Taking this concept to the next level, world-renowned scientist and researcher Dr. Emoto has uncovered water's ability to absorb energies and physically change based on its surroundings. Below are examples of the physical appearance of various waters:

Sources of Contamination

Water pollution is the contamination of water bodies such as lakes, rivers, oceans, and groundwater, which can be harmful to the organisms and plants that live in these water bodies, as well as the humans that consume or bathe in it.

The primary sources of water pollution are generally grouped into two categories based on their point of origin. Point-source pollution refers to contaminants that enter a waterway through a discrete "point source". Examples of this category include discharges from a wastewater treatment plant, outfalls from a factory, leaking underground tanks, etc. The second primary category, non-point source pollution, refers to contamination that, as its name suggests, does not originate from a single discrete source. Non-point source pollution is often a cumulative effect of small amounts of contaminants gathered from a large area. Nutrient runoff in storm water from flow over an agricultural field, or metals and hydrocarbons from an area with high impervious surfaces and vehicular traffic are examples of non-point source pollution.

The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical or sensory changes. While many of the chemicals and substances that are regulated may be naturally occurring (iron, manganese, etc) the concentration is often the key in determining what is a natural component of water, and what is a contaminant. Many chemicals undergo reactive decay or chemically change especially over long periods of time in groundwater reservoirs.

Pathogens can produce waterborne diseases in either human or animal hosts. Eutrophication is the fertilization of surface water by nutrients that were previously scarce. Water pollution is a major problem in the global context. It has been suggested that it is the leading worldwide cause of deaths and diseases, and that it accounts for the deaths of more than 14,000 people daily.

Towns and municipalities are also major sources of water pollution. One reason for this is that much groundwater has been contaminated by wastes pumped underground for disposal or by seepage from surface water. When contamination reaches underground water tables, it is more difficult to correct and spreads over wide areas. In addition, many U.S. communities discharge untreated or only partially treated sewage into the waterways, threatening the health of their own and neighboring populations.

Along with domestic wastes, sewage carries industrial contaminants and a growing tonnage of paper and plastic refuse (see solid waste). Although thorough sewage treatment would destroy most disease-causing bacteria, the problem of the spread of viruses and viral illness remains. Additionally, most sewage treatment does not remove phosphorus compounds, contributed principally by detergents, which cause eutrophication of lakes and ponds. Excreted drugs and household chemicals also are not removed by present municipal treatment facilities, and can be recycled into the drinking water supply.

Rain drainage is another major polluting agent because it carries such substances as highway debris (including oil and chemicals from automobile exhausts), sediments from highway and building construction, and acids and radioactive wastes from mining operations into freshwater systems as well as into the ocean. Also transported by rain runoff and by irrigation return-flow are animal wastes from farms and feedlots, a widespread source of pollutants impairing rivers and streams, groundwater, and even some coastal waters. Antibiotics, hormones, and other chemicals used to raise livestock are components of such animal wastes. Pesticide and fertilizer residues from farms also contribute to water pollution via rain drainage.

History of Filtration

The earliest recorded attempts to find or generate pure water date back to 2000 b.c.e. as evidenced by early Sanskrit writings that outlined methods for purifying water. These methods ranged from boiling or placing hot metal instruments in water before drinking it to filtering that water through crude sand or charcoal filters. These writings suggest that the major motive in purifying water was to provide better tasting drinking water. It was assumed that good tasting water was also clean. People did not yet connect impure water with disease nor did they have the means necessary to recognize tasteless yet harmful organisms and sentiments in water.

Centuries later, Hippocrates, the famed father of medicine, began to conduct his own experiments in water purification. Like those before him, Hippocrates also believed good taste in water meant cleanliness and purity of that water. Hippocrates designed his own crude water filter to "purify" the water he used for his patients. Later known as

the "Hippocratic sleeve," this filter was a cloth bag through which water could be poured after being boiled. The cloth would trap any sentiments in the water that were causing bad taste or smell.

Evolution of Water Filtration

Long before deaths were linked to poor water quality, people were beginning to suggest that pure water should be provided to every household through citywide water filtration. The supposition that every person deserved clean water to drink and bathe in was related to the general philosophical themes of the Enlightenment period in Europe. During the Age of Enlightenment of the sixteenth through eighteenth centuries, philosophers ruminated over the natural rights of all humanity.

The right to clean, pure water began to be associated with these innate rights of all humanity. Such philosophical discussions led the French scientist La Hire to propose that every French household have a sand water filter installed that would provide clean water to that household. Sand filters were the most popular method of water filtration throughout many European towns.

About 100 years after La Hire first suggested that all citizens should be given the right to pure water, government officials in the United Kingdom began to wonder, also, if every household in their domain should be provided with some kind of filtered water. In 1804, the first citywide, municipal water treatment plant was installed in Paisley, Scotland (Baker & Taras, 1981). This plant would provide filtered water to every household within the city limits. The Scottish water treatment plant depended upon slow sand filters designed by Robert Thom, an important scientist of the Scottish Enlightenment. In 1827, James Simpson, an English scientist, created a similar design to Thom's, and the Simpson water filter models were soon implemented in municipal water treatment plants throughout England.

The slow sand water filters designed by Thom and Simpson were very large and required frequent and extensive cleaning. Because of the growing need for filtered water, scientists in the United States designed a rapid sand filter in the late nineteenth century (Baker & Taras, 1981). The rapid sand filter was cleaned by powerful jet streams of water, greatly increasing the efficiency and capacity of the water filter.

Water Treatment 101

Fortunately, the water industry has evolved tremendously since the "Age of Enlightenment". Water treatment techniques can be segregated into a few basic categories:

Sediment Removal

Virtually all water contains suspended as well as dissolved particulate. Depending upon the concentration, suspended matter in water can accumulate inside any water system and cause a significant reduction in flow rate or performance. To remove the accumulated sediment, a physical barrier is required. The water industry has perfected sediment removal/reduction with the creation of fibrous or ceramic filtration systems.

Sediment filters have a micron rating (1 micron = 1/25,000 of an inch) that specifies the level of filtration. The most common micron rating on sediment filters is 5 and the smaller/lower the micron rating, the greater level of filtration. If present, bacteria and viruses are considered suspended matter and can be removed with filtration. A general rule of thumb in water treatment is that any filter with a rating of .2 microns or less is considered to provide protection from bacteria and cysts, and a .01 micron rating on a filter indicates protection from viruses. Ion Ways offers two different internal filters with a 1 and a .01 micron rating.

Adsorption/Carbon

The most universally used treatment technique is carbon filtration. Virtually every water treatment system, ranging from a Brita pitcher to large municipal treatment plants utilizes carbon. Carbon operates off a principal known as adsorption, which attracts primarily negatively charged particles and captures them. Carbon is the most effective way to remove a wide array of contaminants.

Granular Activated Carbon (GAC) is the form of carbon that has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions. GAC can be compressed into blocks for enhanced performance. Last but not least are Impregnated Carbons with the most prevalent being silver. Carbon does such an excellent job at removing chlorine, which makes it susceptible to bacterial grown inside the media, especially when left in service for too long. Silver impregnation is performed to prevent this from happening. Ion Ways has gone the extra mile and included silver impregnation in its filters.

In some areas across the US, chloramines (chlorine and ammonia) are used instead of free chlorine. In this case, traditional GAC will not work as effectively as it does on free chlorine, so a special type of carbon is needed where 100% removal is desired.

Specialty Resins

In cases where carbon will not remove a specific contaminant, specialty resins are often used. The water industry has a specialty resin that act like little magnets to capture virtually any contaminant. The most common uses for specialty resins are for reduction of arsenic, fluoride and nitrates.

Reverse Osmosis

R/O is by far the most popular water treatment technology in use around the world today. R/O utilizes a technology called nano-filtration (typically .009 micron) to physically filter and remove virtually all suspended and dissolved material in water. The quality of R/O membranes vary but typically between 90% and 98% of all suspended materials (good and bad) are removed and flushed down the drain.

R/O and Water Ionization are often thought of as polar opposites in terms of their effect on the water. R/O water is typically acidic and virtually mineral free while ionized water is high in pH and rich in alkalizing minerals. The negative impacts of more acid in the body are obvious and R/O does not help with this delicate alkaline balance. Furthermore, some health experts feel that mineral-free water can be harmful and actually lead to de-mineralization of the body or force it to function at a mineral deficit. Pure water molecules attach to anything they contact and flush them from the body. The flushing that occurs could include beneficial alkaline minerals, which is detrimental to the alkaline balance. Add to this the concept that your body needs a source of available alkaline minerals to help balance its pH. Water from nature contains these minerals. The concept then follows if we drink pure water (devoid of minerals) we are much more likely to force our body to rob them from other places like the bones, teeth and cardiac system.

The good news with R/O is the fact that virtually all dangerous contaminants are removed so you get virtually pure water. There are however some very difficult issues with R/O - especially when you attempt to mate it with an ionizer. First, in addition to removing all the contaminants, R/O removes all the naturally occurring minerals from the water. Ionization needs the minerals to work, so an ionizer will not work on RO treated water. Secondly, R/O membranes process a very small volume of water and need a storage tank for the water so it is available when you need it - limiting the amount of water available to you. Annual replacement of the filters ($150 retail) and bi-annual replacement of the R/O membrane (is recommended.

Ion Ways Filtration Products

Virtually all water ionizers contain some type of internal filtration. IonWays' BioStone filter is the industry leader and helps significantly reduce contamination in your water, there are a few contaminant-specific situations where some customers may wish to add other optional treatment techniques to improve the filtration. Your water experts at Ion Ways have created a line of water filtration products that address the most common problems found across the US. Using proven, traditional treatment techniques, we have specific products available for removal/reduction each of the following contaminants:

- Arsenic/Lead/Fluoride
- Chloramines
- Heavy Metals
- Hydrogen Sulfide
- Nitrates
- Iron
- E-Coli and Cyst
- Reverse Osmosis
- Virtually all known contaminants (Reverse Osmosis with a remineralization cartridge)

WELL WATER

Emco Tech Ionizers are designed to produce high quality filtered ionized water from municipal (treated) water systems. However, treated municipal water in some areas of the country - such as parts of Arizona, Southern California, Texas, Utah, New Mexico and the mid west - and some well water sources may exceed the parameters mentioned below.

If you have hard water, whether it is well or municipal, contact IonWays with the information mentioned below to assure years of dependable operation from your ionizer. If you are not certain about the hardness of your sources water, please consult with your local water provider and refer to the Water Quality article located in the back office in your resource section. Some municipal water is now being treated with chloramine instead of chlorine. Water treated with chloramine may require special pre-filtration.

- If your source water is from a well, it must be analyzed so that any pre-filtration needs can be addressed. This will ensure the performance and longevity of your investment.
- The information we require to insure maximum benefit and functionality are: TDS (total dissolved solids), hardness, pH, iron, and calcium.

- Your local County or State Health Agency may offer free or low cost water testing. We recommend contacting them first.
- If you have water softeners or other filtration in place, please get the water tested after this filtration, we want to know what is in the water going into the Ionizer.

It is not recommended to use an ionizer without pretreatment in areas with water that has the following measurements:

- Hardness (or Calcium Carbonate) over 150ppm (8.5 grains)
- Iron over .3ppm,
- TDS below 40ppm or over 600ppm
- Calcium above 50ppm

Email or fax a copy of your water report to IonWays – including levels of TDS, Calcium, Hardness, and Iron - for a free analysis. Once your report has been reviewed we will a pre-filtration system if needed.

For the health of your family and yourself, we also recommend testing for other constituents including coliform bacteria, nitrites/nitrates, arsenic, and fluoride. *This is not required for the operation of the machine, but is encouraged for the health and well being of you and your family.*