LIVINGWATERS™

ENGINEERED WATER TREATMENT SOLUTIONS

SAFEWATER™ TECHNOLOGY

A major breakthrough in water treatment science

SAFEWATER™ TECHNOLOGY

A MAJOR BREAKTHROUGH IN WATER TREATMENT SCIENCE

LIVINGWATERS™ Water Treatment Systems with SAFEWATER™ TECHNOLOGY are the ONLY drinking water systems capable of effective treatment of ALL of the following major categories of water contamination . . .

- **Pathogenic (disease-causing) microorganisms;**
- **Organic Contaminants (insecticides, pesticides, herbicides, solvents, fuels and fuel additives, and PPCPs (pharmaceutical and personal care product residues);**
- **Inorganic Contaminants (fluoride, arsenic, nitrates, asbestos, hydrogen sulfide, iron, manganese);**
- **Heavy Metals (lead, cadmium, mercury);**
- **Chemical Disinfectants and Disinfection By-Products (chlorine, chloramines, trihalomethanes, haloacetic acids, formaldehyde);**
- **Sediment, Turbidity, Tastes, Odors, Color;**

. . . without the need for power, high water pressure, or water waste of any kind.

SAFEWATER™ TECHNOLOGY

A MAJOR BREAKTHROUGH IN WATER TREATMENT SCIENCE

SAFEWATER™ TECHNOLOGY is the nearly perfect marriage of five of the worlds' most advanced and proven water treatment technologies.

These include:

- **Arsenic/Fluoride Adsorptive Media;**
- **Catalytic Activated Carbon;**
- **KDF55® Redox Media;**
- **NanoCeram™ Electro-Positive Superfilters;**
- **Ster-O-Tap® Capillary Membrane Technology.**

This marriage is carefully engineered to result in a water treatment device capable of providing a continuous flow of great-tasting water that is SAFER and HEALTHIER to drink because:

- ✓ **Water is GUARANTEED SAFE from disease-causing cysts, bacteria molds and spores. Even virus are reduced 99.9%**
- ✓ **Fluoride, arsenic, heavy metals and the whole spectrum of organic contaminants are reduced >95% to levels comparable to the best reverse-osmosis systems.**
- ✓ **Healthy alkaline minerals are preserved.**
- ✓ **The redox potential of the water is improved.**

Best of all, the system requires no power, wastes no water, and does not require high water pressures to operate, so it ***will work in emergencies when you need it the most!***

FLUORIDE/ARSENIC ADSORPTIVE MEDIA

As water begins its journey through a 5-Stage **LIVINGWATERS™ ALKALIZER**, the first media it encounters is a premium fluoride/arsenic adsorptive media we call FRC.

New research demonstrates that **fluoride in water causes an increase in the body's uptake of lead, thereby damaging the nervous system. It is also known that fluoride compromises the immune-system, is an endocrine disruptor, and can cause mottled teeth in young people and brittle-bone syndrome in the elderly.**

Most leading water treatment scientists, including a consortium of scientists from the National Academy of Sciences, now agree that any beneficial effect on tooth decay cannot justify taking the many other serious risks associated with drinking fluoridated water.

There is no safe level of arsenic in water. Arsenic causes skin, kidney and nervous system damage, and is a potent carcinogen. According to the National Academy of Sciences, **even at the EPA limit of 10 ppm, arsenic is capable of causing 1 cancer in every 500 people.** The only reason the limit is not set lower is because of how expensive it is for affected municipalities to remove arsenic from water.

FRC is a premium grade of adsorptive media certified to NSF 61, meaning that it does not leach anything toxic back into product water. It is also listed by the U.S. Environmental Protection Agency (EPA) as a "best available technology" (BAT) for the efficient removal of arsenic and fluoride from water. It can reduce the content of typical waters to levels comparable to or better than reverse osmosis.

KDF55® REDOX MEDIA

Once the water has been cleaned of its toxic load of fluoride and arsenic, it begins another journey this time through cartridge that contains a remarkable media called KDF55®.

A high purity alloy of copper and zinc, KDF® eliminates contaminants from water by utilizing the principle of electrochemical oxidation reduction known as the redox process. Redox is simply the principle of opposites at work. When contaminants in water come in contact with redox media, some lose electrons to the media while others gain electrons. This gain or loss of electrons changes the chemical nature of the substance.

When water containing dissolved oxygen, minerals, metals, and organic materials enters a bed of KDF55®, the copper becomes the cathode and the zinc becomes the anode within each granule. The minute space between each granule becomes an electrolytic cell, with the water and its contaminants acting as the electrolyte.

As contaminants and oxygen pass through, some minerals (like heavy metals) plate out on the surface of the granules. In addition, other contaminants react causing zinc oxides, sulfates, and hydroxides, and copper hydroxides to form in controlled amounts. These compounds are carried into the filtered water and along with ozone created in the process, provide hostile conditions for algae, fungus, and bacteria growth. The copper and zinc chelates produced by the system are not only harmless in the amounts produced, they are actually healthful nutrients.

Of further benefit, KDF® works to modify the electron structure of hardness ions to the extent that it interferes with scale deposits. Instead of precipitating out of the water as lime-scale, they are changed into a very soluble carbonate which does not adhere to surfaces and is easily flushed away.

KDF55® redox media removes dissolved gases such as chlorine, hydrogen sulfide and methane from water. It can also remove virtually any soluble metal, help prevent mineral hardness scale accumulation and reduce levels of microorganisms.

What makes it unique, however, is that all the energy necessary to remove contaminants from water is inherent in the electrochemical and catalytic potential of the redox alloy. Because it is so versatile, it is a valuable choice for a wide variety of water treatment applications, including:

- **Dechlorinating.** High purity copper-zinc redox media consistently remove 99 percent of free chlorine from drinking water by electro-chemically reducing dissolved chlorine to water-soluble chloride ions.

- **Removing dissolved heavy metals.** KDF55® removes up to 98 percent of water-soluble cations of lead, mercury, copper, nickel, chromium, cadmium, arsenic, antimony, cobalt and most other dissolved metals upon direct contact. The removal mechanism is electrochemical and partially catalytic. Soluble lead cations are reduced to insoluble lead atoms and electroplated onto the surface and interstices of the granular media.

- **Improves redox potential of water.** KDF55® creates an easily measured oxidation/reduction potential (ORP) shift from +200mV for untreated water to -500mv, for water filtered through redox media. This turns water into an electron donor in the body, thereby causing water to act like a valuable anti-oxidant.

- **Controls microbial growth.** Water treated with a redox media comprised of a copper-zinc alloy reduces bacteria and other microorganisms by disrupting electron transport, causing a cascade of cellular damage. Redox media also kill bacteria by direct electrochemical contact and by the flash formation of hydroxyl radicals and hydrogen peroxide, both of which interfere with a microorganism's ability to function.

CATALYTIC ACTIVATED CARBON

Once water has had its toxic load of fluoride, arsenic, chlorine and unhealthy metals removed, it is ready for processing by catalytic activated carbon.

Standard activated carbon works to remove contaminants from water in two ways. The first is by a process known as adsorption (not absorption) where the electrochemical nature of the compound is able to attract other substances to it.

Carbon is one of the most powerful adsorbents known to man, partly because of its organic nature, and partly because it is so porous. One pound of activated carbon contains a surface area of roughly 125 acres and because it has a slight electro-positive charge, can adsorb literally thousands of different chemicals.

Standard activated carbon media is able to remove/reduce many volatile organic chemicals (VOCs), pesticides and herbicides, as well as chlorine, benzene, trihalomethane (THM) compounds, radon, solvents and hundreds of other man-made chemicals found in tap water.

But carbon also works by catalytic reduction, a process involving the attraction of negatively-charged contaminants to the positively-charged activated carbon matrix. **Once there, catalytic sites in the carbon matrix work to break apart certain contaminants into smaller components that can then be adsorbed by the carbon.**

Catalytic carbon works not only by adsorption as with other premium carbons, but it has been developed so that is contains a much larger volume of catalytic sites spread throughout the surface of the media.

Developing this functionality in activated carbon is expensive, but it is why catalytic activated carbon is the most effective treatment for compounds like chloramine and pharmaceutical residues that are otherwise very difficult to remove from water.

NANOCERAM® ELECTRO-POSITIVE NANOFILTRATION MEDIA

By this time the water has had its toxic load of fluoride, arsenic, and heavy metals, as well as a wide array of organic chemicals, pharmaceutical residues, and disinfectants like chlorine and chloramine removed. What remains are healthy minerals, and potential deadly microbes. It is time for our NanoCeram®/Ster-O-Tap® microbiological purifier. **This remarkable cartridge is a redundant and fail-safe result of nonotechnology that can render water that is GUARANTEED SAFE from cysts, bacteria, molds and spores, as well as provide a reduction of >99.9% of virus!**

WHAT IS NANOTECHNOLOGY?

Nanotechnology endeavors to control matter on a nano (meaning nanometer) level. A nanometer is one billionth of a meter. The double helix molecule that is the foundation of our genetic code is about 2 nm wide. The comparative size between a nanometer and a meter is the same as the difference between a marble and the earth.

Nanotechnology exploits the fact that materials reduced to the nano-scale show different properties compared to what they exhibit on a macro-scale. For instance, opaque substances become transparent (copper); stable materials turn combustible (aluminum); solids turn into liquids at room temperature (gold); and insulators become conductors (silicon.)

The goal is to develop materials or devices that take advantage of these properties to make products that are lighter, stronger, cleaner, more effective, less expensive and more precise.

WHAT IS NANOCERAM®?

NanoCeram® is a revolutionary new microbial filter media, capable of retaining all types of sub-micron particles, including silica, natural organic matter, metals, bacteria, DNA and virus with high efficiency, yet it exhibits a flow rate from tens to hundreds of times greater than any other filter media capable of the same performance.

The active ingredient of the filter media is a nano alumina (AlOOH) fiber, only 2 nanometers in diameter. The nano fibers are highly electropositive.

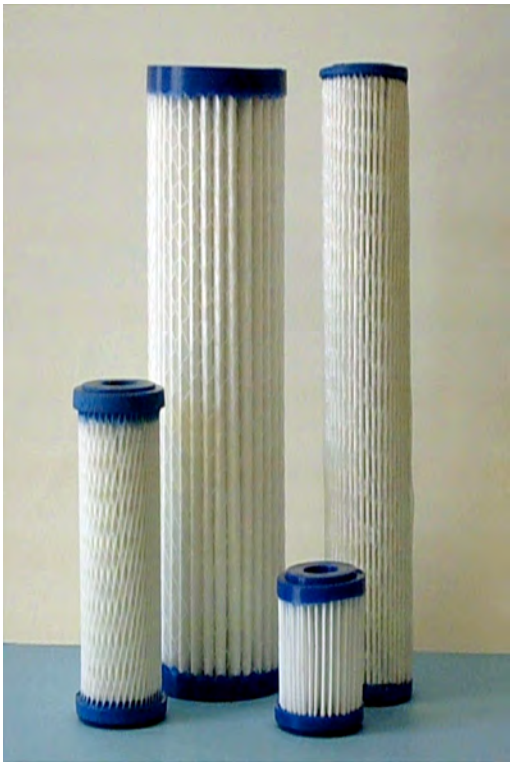
ELECTRO-POSITIVE FILTERS

Most filters separate particles by the mechanisms of sieving, inertial impaction, interception and diffusion. This is true of most membranes as well as fibrous depth filters. In contrast, electropositive filters principally use adsorption (electro-adhesion) as the filtering mechanism.

Electro-adhesion or adsorption utilizes the difference in charge that may exist between a surface (or fiber) and a particle in an aqueous solution. This charge becomes a driving force between the particle and the fixed surface, acting to attract or repel the two. This force is called "zeta potential."

Bacteria and virus are electronegative in water. Smaller particles also tend to become more electronegative too. That is why a media like NanoCeram® that is so porous, yet has a very high surface area filled with electro-positive sites, can be so effective at attracting and retaining particles like virus and other submicron-sized particles.

FEATURES OF NANOCERAM® FILTER



- Flow rates (flux) tens to hundreds of times greater than ultra-filtration membranes.
- NanoCeram® separates particles by charge rather than size.
- Higher reduction of virus than any "Absolute" ultra-porous membrane filters
- Endotoxin removal > 99.96%
- DNA removal > 99.5%
- Resistant to clogging by fine and ultra fine particles.
- Pleated versions have 5-8 times higher dirt holding capacity than typical cartridges.
- Filtration efficiency for micron size particles >99.995%

NanoCeram® is the perfect pre-filter for the capillary membranes that follow. Not only are virus and bacteria removed, but so are extremely fine particles that can cause premature fouling. This results in a cartridge with high flow rates, a long service life, and an unsurpassed ability to create water that is clean and clear!

STER-O-TAP® CAPILLARY MEMBRANE TECHNOLOGY

At the heart of ***SAFEWATER™ TECHNOLOGY*** are the same capillary membranes used in a product called LifeStraw®.

Capillary membrane technology is a major breakthrough that is revolutionizing the water treatment industry.

It is a water treatment process that Forbes Magazine ranks with gene therapy and fuel cells as:

"One of the 10 Things That Will Change the Way We Live." [1]

Why such praise? Even though 70% of the earth's surface is covered in water, less than 3% is fresh water, and 90% of that is locked in glaciers and icebergs. Only 1% of the world's water supply is available for drinking and the majority of that is so polluted that it is undrinkable without causing disease. Up to 75% of all diseases in the developing world are water-related.

For the first time in human history, capillary membrane technology like that in Ster-O-Tap® offers humanity a way to economically and simply disinfect even highly contaminated water, all without the need for power, high water pressure, or water waste.

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1 *"Ten Things That Will Change the Way We Live"* by Ely Breckinridge, Forbes Magazine, 02/17/2006

THE WORLD'S WATER PROBLEM

FACT: More that one billion people (one-sixth of the world's population) lack safe drinking water. Every day, an estimated 10,000 people die of water-related diseases. That is 6.9 people every minute. 3 million children under 5 die from dirty water each year. That is 300 children every hour!

UNITED STATES ISSUES

There is no doubt the United States enjoys one of the best supplies of drinking water in the world today. Nevertheless, according to the National Resources Defense Council, each year **half of all Americans are exposed to some form of dangerous pathogen, chemical or mix of chemicals in their drinking water.**

Although tap water that meets federal and state standards is reasonably safe to drink, threats to drinking water quality in the United States still exist. These threats come from three primary sources.

Natural and Man Made Pollution of Lakes, Streams, and Underground Aquifers

Water contaminants may be the result of naturally occurring chemicals and minerals (e.g., arsenic, radon, uranium), local land use practices (fertilizers and pesticides), microbial contamination, manufacturing processes, and problems with the integrity of nearby onsite wastewater systems (e.g., septic systems).

Outdated Water Treatment Facilities

Most facilities are built to clarify water and disinfect it. Most are not able to remove contaminants like pesticides, industrial wastes, nitrates and arsenic.

Deteriorating Infrastructure that delivers water from the treatment plant to the customer

Much of the existing water infrastructure (underground pipes, treatment plants, and other facilities) was built many years ago. From 1995 to the year 2000 over $50 billion was spent on capital improvements to water treatment and distribution systems. In 1999, EPA conducted the second Drinking Water Infrastructure Needs Survey, and found that drinking water systems will need to invest $150 billion over a 20-year period to ensure clean and safe drinking water.

The Result: The CDC national assessment study indicates that over 7 million people get sick and hundreds die from drinking contaminated water in the United States each year!

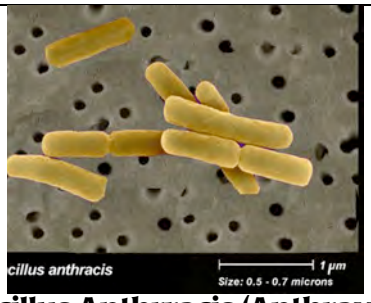
UNDERSTANDING BIOLOGICAL CONTAMINANTS

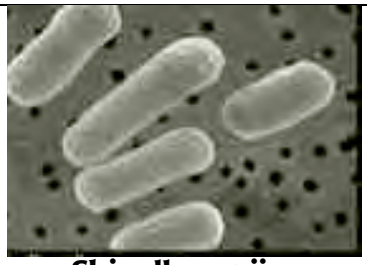
Pathogens in drinking water are serious health risks. Pathogens are disease-producing microorganisms, which include bacteria such as Salmonella and E. Coli, protozoans (such as giardia lamblia) and their cysts, viruses, and parasites. Pathogens get into drinking water when the water source is contaminated by sewage and animal waste, or when wells are improperly sealed and constructed. They can cause gastroenteritis, salmonella infections including typhoid fever, cholera, dysentery, shigellosis, hepatitis, and giardiasis (a gastrointestinal infection causing diarrhea, abdominal cramps, and gas).

Bacteria occur in un-sanitized water at levels from 100,000 to 1,000,000 organisms per milliliter. Since there are approximately 250 milliliters (± 1/2 pint) in an 8-ounce glass of water, that glass can contain from 25 million to 250 million bacteria of various types.

It is not only ingested bacteria that can have serious health effects. **Certain bacteria, if inhaled, can also cause severe forms of infection.** In 1976, a bacterium called Legionella Pneumophilia cause was found to be the cause of a severe respiratory illness called Legionnaires Disease.

Below is a very interesting chart that shows some of the more common infectious pathogens, their size, and the approximate number of organisms required to create an infection.

Organism	Approx. Size (in microns)	Approx. Infectious Dose	Comments
 **Bacillus Anthrracis (Anthrax)**	3.5 x 0.5	5,000 to 10,000	Anthrax is an acute disease in humans and animals caused by the bacterium Bacillus anthracis, which is highly lethal. Under conditions of environmental stress, B. anthracis bacteria naturally produce endospores which rest in the soil and can survive for thousands of years. B. anthracis may be inoculated into a wound, inhaled or ingested.
 **Cryptosporidium oocyst**	3	1 or more	A study published in 1991 (Rose, Gerba, Jakubowski) found crypto oocysts in 55% of the water samples taken from 17 states with an average concentration of 43 oocysts/100L of water. Concentrations seem to increase in the fall of the year.

 **Escherichia coli (*e-coli)***	1.4 x 0.5	1,000 to 100,000	E. coli is one of the most common causes of diarrhea in Americans traveling in foreign countries.
 **Giardia lamblia**	8 - 10	200	A study published in 1989 (Ongerth) found cyst concentrations of .1 to 5.2 cysts per liter in 3 "pristine" rivers in the Pacific Northwest of the U.S. with little seasonal variation. Livestock grazing has rendered even the most alpine streams polluted with this dangerous parasite.
 **Salmonella Typhi**	1	10,000	Most of the 2200 serotypes of Salmonella cause stomach upset, diarrhea, and vomiting. S. typhi and S. paratyphi are waterborne, and cause severe, prolonged disease with many complications (12 – 16% mortality if left untreated)
 **Shigella sonii**	1.6 x 0.5	200	These are common and require only a few organisms for an infectious dose. Symptoms range from mild diarrhea to fever and grossly bloody stools. Illness is self-limiting after approximately one week.

 **Enterococcus faecalis**	1.0 sphere	10,000	These cause mild to severe gastrointestinal illness in susceptible individuals (infants, elderly, or people with compromised immune symptoms).
 **Pseudomonas aeruginosa**	1.2 x 0.5	10,000	Like Enterococcus, these are opportunistic bacteria that cause mild to severe gastrointestinal illness becoming more serious in susceptible individuals (infants, elderly, or people with compromised immune symptoms).
 **Vibrio Cholera**	1.45 x 0.45	10,000	Extremely dangerous, these bacteria are responsible for the cholera epidemics that occur when humans drink infected water. Death can occur within hours as a result of dehydration and circulatory collapse. In areas where this organism is common, many people have some degree of acquired immunity.
 **Legionella Pneumophilia**	0.5 x 0.7		Legionella disease (or Legionellosis) is an infection caused by the bacterium Legionella Pneumophilia. The disease in its mild form causes spells of fever, but in its severe form it includes pneumonia with fatality rates of about 15%.

THE ADVANTAGE OF SAFEWATER™ TECHNOLOGY

Remember that a single glass of un-sanitized water can contain between 25 million and 250 million organisms? **Systems that advertise that they remove 99.9% (3 log) of dangerous microorganisms would leave in the above-mentioned glass between 25,000 to 250,000 organisms.** A glance at the above chart shows that the remaining 0.1% is still more than enough to be an infectious dose, depending on the micro-organism. The same applies to aerosolized water.

Ster-O-Tap® products have been tested and certified for ANSI/NSF Standard 42 for Particulate Reduction, Class 1 and ANSI/NSF Standard 53 for Cyst and Turbidity reduction.

The GfPS is an FDA recognized testing institute in Aachen- Germany. Tests confirm a 6 log removal rate (99.9999%) of all bacteria. Ultrafiltration models meet a 4 log removal rate (99.99%) for virus, thus meeting EPA standards for a microbiological purifier.

The KIWA is the Quality Assurance Organization for the Dutch Water Works Corporation and the certifying body for all water related products. As such it is comparable to NSF International. Test results are the same as GfPS above.

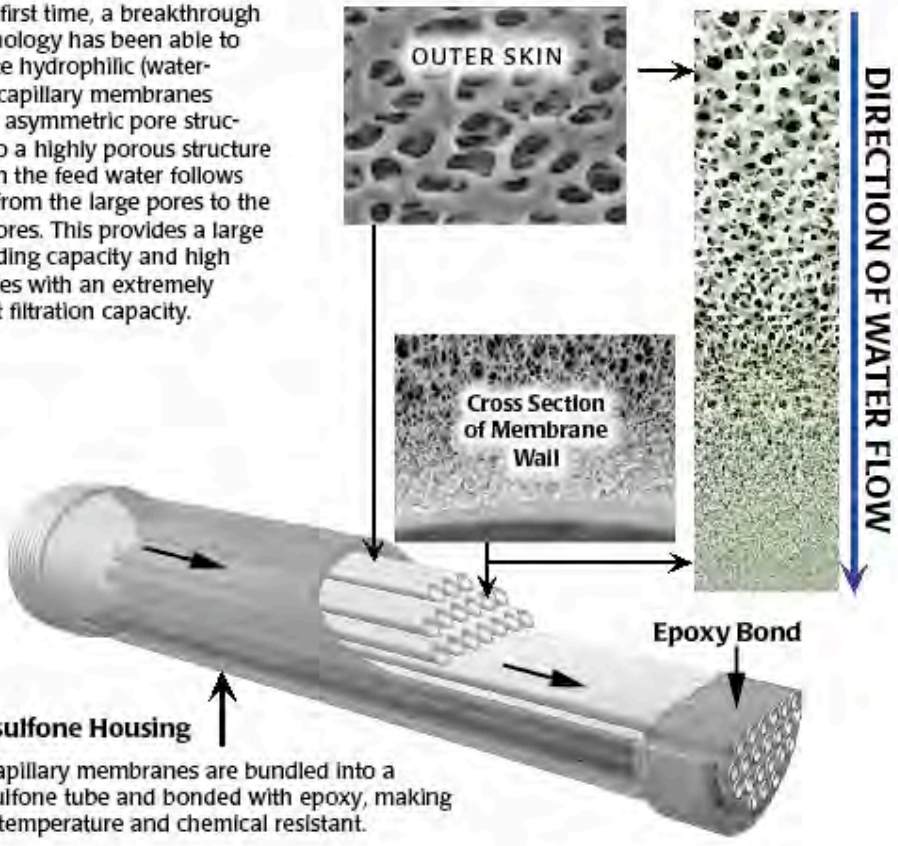
The same capillary membranes used in our ***SAFEWATER™ TECHNOLOGY*** have been independently tested by the University of North Carolina. These results confirm reduction rates of microbiological pathogens equal to the standards listed above.

MEMBRANE COMPOSITION

STER-O-TAP® CAPILLARY MEMBRANE TECHNOLOGY

Ster-O-Tap® Cartridges offer unprecedented water disinfection capacity. They are the first technology to offer 6 log removal (>99.9999%) of all particles larger than 0.15 micron, as well as all bacteria, cysts, spores, fungi, and algae, at high flow rates with minimum pressure requirements. This disinfects water without the need for power, chemicals, or water waste.

For the first time, a breakthrough in technology has been able to integrate hydrophilic (water-loving) capillary membranes with an asymmetric pore structure into a highly porous structure in which the feed water follows a path from the large pores to the small pores. This provides a large dirt-holding capacity and high flow rates with an extremely efficient filtration capacity.



The capillary membranes are bundled into a polysulfone tube and bonded with epoxy, making them temperature and chemical resistant.

SAFEWATER™ TECHNOLOGY

A MAJOR BREAKTHROUGH IN WATER TREATMENT SCIENCE

Remember, the primary purpose of any drinking water system is to KEEP YOUR WATER SAFE.

LIVINGWATERS™ Cartridge-Based Alkalizers are the only water treatment systems in the world that utilize this combination of patented, leading edge technologies known as *SAFEWATER™ TECHNOLOGY* to create a RELIABLE and CONTINUOUS stream of the highest quality drinking water available today.

They are the only systems that can offer:

- ✓ **Guaranteed Removal of Microbial Pathogens;**
- ✓ **Effective Reduction of Chlorine AND Chloramine and their disinfection by-products;**
- ✓ **Removal of Fluoride, Arsenic, Heavy Metals, Chemicals, PPCP's, VOC's, and other toxic contaminants to levels that equal or exceed the best reverse-osmosis systems;**
- ✓ **Preservation of healthy alkaline minerals;**
- ✓ **Improved redox potential of water turning water into a healthy anti-oxidant;**

And they do it all WITHOUT THE NEED for POWER, HIGH WATER PRESSURE, or WATER WASTE!

LIVINGWATERS™

ENGINEERED WATER TREATMENT SOLUTIONS

Water Tests & Analysis, Systems Design, Equipment & Supplies

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