



Espresso & Coffee

Water Filtration Application Guide

www.optipurewater.com

*Compare the Performance . . .
. . . Measure the Difference*

◆ **Specialty coffee is the fastest growing segment within the foodservice industry.**

When you listen to coffee purists and roasters describe their brew you will hear terms like fragrance, aroma, flavor, body and finish, in addition to taste. The specialty coffee business has evolved in to much more than “a cup of joe”. At the core of this business is the quality and consistency of the beverages you serve your customers.

◆ **Coffee is 98% Water.** It is essential to consider the impact that water will have on your equipment, your products, your customers and your success. Chemical characteristics of water can have a significant impact on coffee quality and consistency, and are often the cause of inefficient equipment operation and costly repairs. And, if you have several locations, water chemistry can vary from one location to another. Poor beverage quality and equipment problems can be avoided with the right water treatment system. It is impossible to achieve the ‘perfect cup’ without careful consideration of water quality.

◆ **Water treatment is not a mystery** - It is a complex process involving many different aspects of the physical and chemical sciences. The expertise is in the application of specific water treatment technologies to deal with different contaminants in order to produce a desired result. Important considerations are:

- ◆ The system includes the right treatment technologies to deal with specific contaminants that will affect both your equipment condition and beverage quality.
- ◆ The system performance is ‘balanced’; this means that the system will deliver on each of its performance claims, i.e. chlorine reduction, taste & odor reduction, and mineral or scale reduction for the capacity claim (gallons/liters) of the system.
- ◆ The system will perform at the required flow rate.
- ◆ The system capacity is proportional to the actual water usage of the equipment between recommended filter change intervals.

Properly applied, water treatment will improve beverage quality and consistency, assure efficient equipment operation, and eliminate expensive service calls and downtime. It is an investment in the success and profitability of your business.

◆ **Become Knowledgeable** – This document will help you understand the basic characteristics of water and the likely impact it will have on your equipment and your products; and it will guide you through the treatment options available. Make sure the system you choose is right for your application and will deliver the results you expect. The bottom line is: if you don’t understand what filtration does, and how it will protect your equipment and your business, it’s tough to make the best choice.

◆ **It’s all about quality and consistency** – The quality of the beans, the uniformity of the grind and the pack, temperature and pressure, and the timing of the brew or the shot are all variables that must be precisely controlled to create excellent espresso.

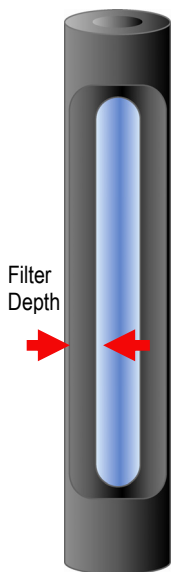
If excellence is your goal, it is imperative that you control the variable that makes up 98% of coffee beverages – water.

Let's look at four types of contaminants that can be problematic and the water treatment technologies used to deal with them:

Particulates - (dirt, sediment, rust)

An array of suspended particles in water can cause added wear on parts, and clog solenoids, screens, valves and other fittings. Fine silt, dirt, rust and other debris settle as sediment and provide a catalyst for scale build-up. There are different types of filtration media used to remove particulates from water. Fundamentally, they work like a 'net' to trap and hold objects larger than the holes in the net.

OptiPure filtration systems filter out suspended particulate matter down to 0.5 micron in size. To get an idea how small this is, one micron is equivalent to 0.000001 meter, a human hair is about 90 microns thick and the smallest speck you can see is about 40 microns across.



OptiPure filtration systems utilize gradient density-depth filtration.

This means that water flowing through the filter passes through nearly $\frac{3}{4}$ " of media that traps particulates within the many layers that make up its depth. The larger dirt particles are trapped in the outer layers of the filter. As the gradient becomes progressively denser, smaller particles are trapped in the deeper layers of the filter. This filtration technology provides exceptional 'dirt-load' capacity, and allows excellent flow with minimal pressure drop between recommended filter change intervals.

Chlorine / Taste & Odor

Most municipal water utilities use chlorine to kill pathogenic organisms and to provide a residual concentration of disinfectant throughout the distribution system. While chlorine makes our water safe to drink, it can contribute to pitting and corrosion in coffee equipment. Chlorine also imparts an offensive taste and odor in water which can affect coffee quality. Activated carbon is the best technology for taking out disinfectant chlorine.

The media structure of the OptiPure cartridge is entirely composed of fibers coated with powdered activated carbon (PAC). A dense structure of these carbon coated fibers make up the entire depth of the CTO and CTOS cartridges used in OptiPure systems. The high mass of powdered activated carbon, along with the gradient-depth structure of these cartridges, provides tremendous surface area and contact time as water flows through. OptiPure's activated carbon chlorine reduction media contributes to the exceptional NSF Certified performance and capacity of OptiPure systems.



Filtering out fine particulates and reducing chlorine, taste & odor is always beneficial to equipment condition and beverage quality; and is recommended as minimal water treatment for all espresso machines and coffee brewers.

Hardness – (scale / lime-scale)

A common and expensive water related problem with espresso machines and coffee brewers is the formation and accumulation of scale. Varying amounts of scale-forming compounds (primarily calcium and magnesium in the form of carbonates) are present in water supplies. These dissolved ‘hardness’ minerals become concentrated in water due to evaporation. Concentration and heat force them out of solution where they form as a hard, adherent, rock-like layer in heat exchangers, group heads and spray heads, and on elements. Over time scale build-up impedes efficient heat transfer, diminishes beverage quality, increases maintenance frequency and can reduce equipment life by years. Scale is the primary water-related problem with coffee brewers and espresso equipment.

Total Dissolved Solids (TDS)

Water is nature’s solvent. It contains, to some degree, everything it can dissolve on the way to your tap. TDS (Total Dissolved Solids) is the measure of a broad array of chemical contaminants (primarily minerals) dissolved in water. TDS includes sodium, iron, nitrates and chloride to name a few. The ions of calcium and magnesium carbonate (hardness minerals) are part of the total dissolved solids, but testing is necessary to determine how much of the TDS is hardness minerals.

There are two fundamental ways to deal with Water Hardness and TDS

1. Inhibit problems with minerals

Inhibiting technologies do not remove dissolved minerals. These technologies interfere with the relationship between the ions of dissolved minerals to inhibit the formation of hardness compounds. Minerals are not removed from the water and TDS is not reduced. Inhibiting technologies, such as OptiPure’s **IsoNet®**, dissolve polyphosphate into water to sequester hardness minerals inhibiting their tendency to form scale. OptiPure’s **ScaleX2®** technology is also an effective scale inhibitor but, unlike IsoNet, ScaleX2 does not add any chemicals to water.

2. Remove problematic minerals

Removal technologies take out dissolved minerals. These technologies effectively eliminate problems by removing problematic minerals. OptiPure’s **OptiSoft** systems take out only hardness ions (calcium and magnesium) by exchanging them for sodium ions. While the process does not lower TDS it does protect equipment against the formation of scale from water hardness. **Advanced Membrane Separation (AMS)** systems take out >95% of all dissolved minerals which eliminates problems associated with water hardness and TDS. When warranted, AMS easily pays for itself by reducing service requirements, optimizing beverage quality and extending equipment life. OptiPure AMS systems include mineral addition or **filtered blending** features to produce water with ideal properties for any coffee or espresso application.

Understand the basic characteristics of your water

Along with water hardness and total dissolved solids (TDS) additional physical characteristics of water, such as alkalinity and pH, influence the tendency of water to form scale. Here is how these water characteristics are measured and expressed in water analysis.

Water Hardness (as CaCO₃) – is a measure of the scale forming compounds of calcium and magnesium. The amount of hardness can be expressed in ppm (parts per million) or mg/l (milligrams per liter). Ppm and mg/l are equivalent measurements. Water hardness is sometimes expressed as ‘grains’ per gallon (gpg). One (US) grain of water hardness is equivalent to 17.1 mg/l of calcium carbonate. For example, 171mg/l CaCO₃ divided by 17.1 = 10 grains per gallon of hardness.

Total Dissolved Solids (TDS) – Also expressed in ppm or mg/l, total dissolved solids are all of the inorganic and organic substances in water that are present in their molecular or ionized form. For example, table salt - NaCl, when dissolved in water become Na⁺ and Cl⁻ ions. Water is referred to as the “universal solvent” because of its ability to dissolve so many different substances. Dissolved ions, such as Na⁺ and Cl⁻, make up the majority of TDS and is what enables electricity to pass through water (electrical conductivity).

Alkalinity – refers to the capability of water to neutralize acid. It is an expression of buffering capacity. Some alkalinity is desirable to balance the corrosive effects of acidity. As it pertains to espresso equipment, alkalinity is an indicator of the potential or tendency for hardness minerals to form scale. Bicarbonate (alkalinity) breaks down when heated and combines with calcium and magnesium to form hardness compounds that precipitate as scale. The presence of alkalinity plays an important role in the extraction of coffee, but too much alkalinity can have a negative effect.

pH – is a measure of the relative balance between acid and alkaline substances in water. It is an indicator of whether water has a tendency to be scale-forming, or to be corrosive. On a scale of 0 to 14, pH7 is neutral - below 7 is acidic and above 7 is basic or alkaline. High pH indicates a scale forming tendency.

A pH near neutral is desirable for coffee beverages

Important Note: A water analysis is only a snapshot of water characteristics when the sample was drawn. It is common for water utilities to blend water from different wells (groundwater) and/or surface water sources (lake, river or reservoir). Different blending patterns along with seasonal changes in water chemistry can result in significant variations in water quality.

Contact your water utility and request a ‘consumer confidence report’. This is a public document that often includes detailed water quality information including the parameters listed here. This information is often available online under city services or utilities. Another online source for this information is the EPA website – keywords SDWIS (safe drinking water information system) – click on “how to access drinking water information”. Information about your water can also be found on the American Water Works Assoc. consumer information site – drinktapp.org

What are the ideal characteristics of water for coffee and espresso?

You will find a range of opinions about the best water characteristics for coffee and espresso. Based upon decades of experience providing water treatment for foodservice applications and working with thousands of customers to improve coffee and espresso beverages and protect equipment, OptiPure offers the following considerations and recommendations.

- High mineral content (TDS) and high water hardness can ruin coffee beverages and cause problems due to scale build-up in equipment.
- A balance of minerals, including calcium, is essential for proper extraction and to achieve the right body, balance, flavor and finish of coffee and espresso.
- Alkalinity and pH also affect the scaling tendency of water *and* play an important role in coffee extraction.

In addition to filtering out particulates and reducing chlorine, taste & odor OptiPure recommends the following water quality parameters to maximize coffee quality and consistency, and protect equipment.

- ♦ 2 to 5 grains (35 to 85 mg/l) of total hardness
- ♦ Alkalinity within the same range as hardness (35 to 85 mg/l)
- ♦ TDS level between 60 and 150 mg/l.
- ♦ Near neutral pH (6.5 to 7.5)

Identify the potential water-related problems in your situation, and assess the impact it can have on your equipment and your business.


- ♦ *How important is beverage quality and consistency to your business?*
- ♦ *How frequently will your equipment require service, and at what cost?*
- ♦ *Are water-related problems covered under the equipment warranty?*
- ♦ *How many years will your equipment last and what is the replacement cost?*

OptiPure application recommendations are based upon a systems tested and proven ability to help protect equipment against undesirable water characteristics. It is important to note that water chemistry and the mechanical aspects of coffee and espresso equipment can be very complex. A range of variables influence the overall impact water will have on equipment in a given application.

The purpose of this document is to help OptiPure users understand how water contaminants can affect their coffee equipment and beverage quality and consistency, and the treatment options available; and to share important considerations for making an informed decision about selecting the best water treatment for their application. The water quality parameters presented here are general application guidelines. Recommendations may vary based upon application specifics, and equipment design and features.

Application Recommendation



	Consider when	Recommended when
Hardness	> 85 ppm (5 grains)	> 135 ppm (8 grains)
Alkalinity	> 85 ppm	> 100 ppm
TDS	> 150 ppm	> 200 ppm
pH	6.0 to 10	6.0 to 10

OptiPure AMS virtually eliminates water-related problems with equipment and provides water with the ideal characteristics for coffee and espresso beverages.

Advanced Membrane Separation (AMS) – Unlike *filtration*, which is a process of trapping and holding contaminants within a filter media, *membrane separation* is a process where contaminants rejected by the membrane are rinsed away to the drain. Nothing is trapped and held in the membrane media. It is a *separation process*.

Reverse Osmosis (RO) is a near absolute removal process that takes out nearly all (>95%) of the total dissolved solids (TDS) and ions in water. Water with this degree of purity can be corrosive and lacks the mineral content and chemical balance needed for proper coffee extraction. A typical reverse osmosis system is not recommended for use with brewed coffee or espresso applications.

The OptiPure BWS-QT is designed specifically for specialty coffee applications. This is a complete, integrated system that utilizes reverse osmosis to remove TDS from water which is then blended with specially treated water to a user determined level. The blended water can be adjusted to produce “optimized” water with the ideal water characteristics for espresso and brewed coffee regardless of variations in feedwater chemistry from one location to another; or seasonal variations in the same location. The system produces up to 400 gallons of water per day which can also be used for most other equipment applications such ice, water and hot water dispensers.

The compact, wall-mount system includes integrated pre-filtration with particulate and chlorine reduction, ScaleX2® scale inhibitor technology and the AMS (RO) processor. Shown here is a 50 gallon atmospheric storage tank with a top-mounted variable speed repressurization pump.

OptiPure offers a range of self-contained, free-standing and wall-mount AMS systems capable of meeting the production and demand requirements for any specialty coffee application.



Application Recommendation



	☞	Consider when
Hardness		> 85 ppm (5 grains)
Alkalinity		> 100 ppm
TDS		> 150 ppm
pH		6.5 to 9.5

Softening water by Ion Exchange is simply a process of trading trouble-producing hardness ions for harmless sodium ions – For use with espresso machines.

Water softening has been used with espresso machines for a long time, and it is an effective technology for protecting equipment against scale. However, many espresso and coffee experts consider softened water to be lacking in mineral content and balance important for coffee quality. OptiPure considers softened water, combined with sediment and chlorine taste and odor reduction, to be an effective scale protection technology for low to moderate volume applications where water hardness may be problematic, but is not excessive.

The amount of hardness in water is expressed in ‘grains-per-gallon’ (gpg). One grain of hardness is equivalent to 17.1 mg/l of calcium carbonate. When using softening it is important to understand that unlike most filtration systems, which have a capacity rating in ‘gallons’, a softening system’s capacity is expressed in grains. So, when using softening to protect equipment against scale you must know the amount of hardness (gpg) in the water, and the amount of water required each day by the application. Both have a significant impact on the ‘life’ of a softening system and will dictate the filter change frequency for an application.

Here is how to calculate the capacity of a softening system (in gallons) and determine the filter change frequency.

To calculate (gallons) softening system capacity – divide the grain capacity of the treatment system by the water hardness in grains-per-gallon (gpg).

Example: 4,500 grains capacity / 10 gpg = 450 gallons capacity.

To calculate filter change frequency – divide the (gallons) capacity of the system by the number of gallons used each day.

Example: 450 gallons capacity / 5 gallons per day = 90 days

In this example the filters should be changed every 3 months.




Model QTSFT-3 (shown here) has a 4,500 grain softening capacity; and has sediment and chlorine taste & odor reduction incorporated into the system.

IMPORTANT: The QTSFT-3 was designed specifically for espresso applications. Softened water is not recommended for use with coffee brewers.

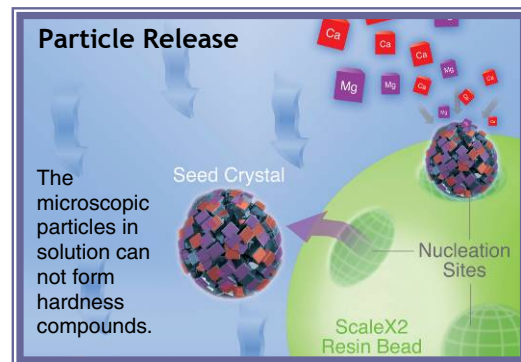
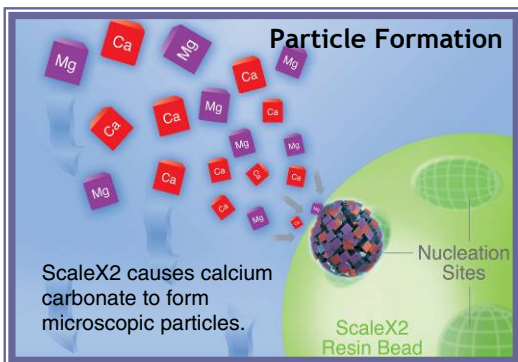
Application Recommendation



	Consider when
Hardness	> 85 ppm (5 grains)
Alkalinity	> 100 ppm
TDS	> 150 ppm
pH	6.5 to 9.5

ScaleX2® technology is a simple, reliable and cost-effective solution for protecting coffee and espresso equipment against the formation and build-up of damaging scale. ScaleX2® does not add chemicals and does not remove calcium from water.


ScaleX2® instantly transforms dissolved hardness ions into microscopic particles that become suspended in solution greatly reducing the potential for scale formation. The microscopic particles prevent the formation of hardness compounds in boilers and hot water tanks.



ScaleX2® is an effective alternative to polyphosphate inhibitors and softening resins.

ScaleX2®:

- ◆ *does not remove calcium or other minerals from water*
- ◆ *does not add sodium or chemicals to water*
- ◆ *is effective in high temperature/boiler applications*
- ◆ *is not negatively affected by pH variations*
- ◆ *requires changing the ScaleX2® filter only once a year in most cases*


 *Draining and replenishing the water in boilers and hot water tanks on a routine basis enhances the performance of ScaleX2® further reduces the tendency of scale to form.*

OptiPure systems with ScaleX2® are available with a range of capacities and flow rates to meet a variety of application requirements. ScaleX2® models SX2-21 and SX2-22 are Tested and Certified by NSF International.



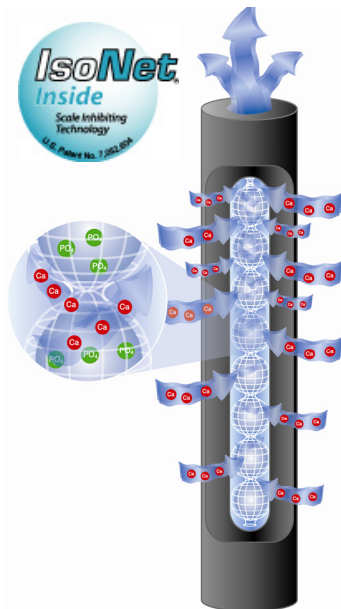
Application Recommendation



	Consider when
Hardness	> 85 ppm (5 grains)
Alkalinity	> 100 ppm
TDS	> 150 ppm
pH	6.5 to 9.5

IsoNet®, OptiPure’s patented scale inhibitor and corrosion protection technology, is the economical choice for coffee brewer applications.

IsoNet® interferes with the formation of hardness compounds which inhibits the formation and accumulation of scale. What makes IsoNet® unique is its patented design that allows for consistent delivery of media and greater capacity. It also forms a protective barrier layer on metal surfaces to help guard against corrosion.



IsoNet® ensures consistent dosing by trapping and holding the right blend of scale & corrosion inhibitor media in the ideal position within the core of the cartridge.

Inhibitor media dissolves into the water stream where it reacts with dissolved minerals and interferes with the formation of hardness mineral compounds. IsoNet’s corrosion inhibitor protects metal surfaces.

- **Consistent Delivery** - All the water flowing through the cartridge comes in contact with the inhibitor media.
- **High Capacity** - IsoNet® sustains sufficient media surface area to provide consistent dosing and protection for the period between filter changes.

OptiPure systems with IsoNet® are available with a range of capacities and flow rates to meet a variety of application requirements. OptiPure FXI, FXTS and QTI, QTTS systems with IsoNet® are Tested and Certified by NSF International.



IMPORTANT: There are significant functional differences between a coffee brewer and an espresso machine. The effects of water chemistry with these devices also differ. **OptiPure does not recommend any polyphosphate-based scale inhibitor, including IsoNet®, be used with espresso machines.**

System Selection

Once you choose the right water treatment technology for your application, you must select a system that will meet your usage requirements.

A properly sized water treatment system will assure that your equipment always performs at its peak.

Three important performance factors to consider are:

Capacity – *As a general rule, a system’s ‘rated capacity’ should meet or exceed the actual water usage of the equipment for the period between filter changes.* The ‘rated capacity’ (gallons/liters) of an NSF Certified system refers only to its ability to reduce chlorine in accordance with NSF/ANSI Standards. With non-certified systems ‘capacity’ almost always refers to chlorine reduction as well.

OptiPure system capacity and performance claims are based upon a system’s tested and proven ability to provide complete (balanced) protection to equipment between filter changes. Exceeding the filtration system capacity or flow rate can compromise system performance and equipment operation.

Balance – *When different technologies are combined in a filtration system, such as chlorine reduction & scale inhibition, both should perform for the ‘rated capacity’ claim of the system.* If, for example, a system’s scale inhibitor performs for only half of the capacity claim associated with the system, then different filter cartridges will have to be monitored and changed at different intervals, otherwise you will not receive the protection you expect. If a system is not ‘balanced’ filter change frequency can be frequent, expensive and a hassle to manage.

Flow Rate – *A filter systems ‘flow rate’ should be greater than the peak flow requirement of the equipment it serves.* Over time, a particulate filter will accumulate dirt and sediment which can restrict and reduce the flow rate. It is important to allow for this when selecting the right system for an application.

The OptiPure ‘System Application Guide & Product Catalog’ provides a simple five step process to help you select the right system for your application.

Filter Replacement

Perhaps the most important and most overlooked component of realizing the benefits of water treatment is replacing filter cartridges on a routine basis.

Properly applied and maintained, water treatment will yield tremendous benefits to a foodservice operation. The benefits are proven and the value is measurable. But your business will not benefit from even the best water treatment if filter cartridges are not replaced on a timely basis.

Most OptiPure system recommendations are based upon a six month interval between filter changes. Check the system specification sheets for detailed filter change information. The OptiPure catalog and system specification sheets are available online at www.optipurewater.com

Contact your OptiPure distributor or OptiPure for assistance selecting the right water treatment for your business.

