



# Ice Maker

## Water Filtration Application Guide

[www.optipurewater.com](http://www.optipurewater.com)

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

◆ **Ice is 100% Water** – It is important to consider the negative impact that poor water quality can have on your equipment, your products, your customers and your success. Expensive repairs, shortened ice machine life and poor beverage quality are often due to water-related problems that can easily be avoided with the right filtration.

◆ **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 ice and beverage quality, assure efficient equipment operation and production, and eliminate expensive service calls and downtime. It is an investment in the success and profitability of your business.**

◆ **It's a lot like buying tires** - If you buy tires with a 40,000 mile rating, you would expect to enjoy the benefits of a smooth ride and safe handling to last until you replace them. But if after 10,000 miles the ride is rough and handling is terrible, then the performance claims are not in 'balance' with the mileage rating (capacity) and the tires were a poor choice. The same can happen with water filtration systems. This document will help you understand water-related problems with ice machines and it will guide you through the treatment options available.

◆ **Consider the financial impact** - How frequently will your equipment require service, and at what cost? Are water-related problems covered under the equipment warranty? How will downtime and service interruption affect business? How does scale build-up affect operating efficiency and production? How many years will your equipment last and what is the replacement cost? Once the financial impact is considered, simply weigh the value of maximizing equipment life and minimizing maintenance against shortened equipment life, inefficient operation and more frequent maintenance and service.

◆ **Ask the right questions** – Armed with a basic understanding of water-related problems, the financial impact it can have on your business, and the treatment technologies used to protect against them; you can be confident that your filtration choice will be the right investment for your business.

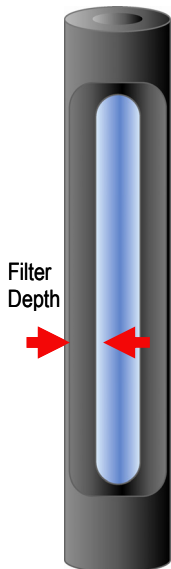
**The bottom line is: if you don't understand what filtration does, and how it can impact your business, it's tough to make the best choice.**

**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)**

Suspended particulates in water cause added wear on parts, and can 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 disinfectant throughout the distribution system. While chlorine makes our water safe to drink, it can contribute to pitting and corrosion in ice equipment. Chlorine also imparts offensive taste and odor in water which can affect beverage 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 powdered activated carbon chlorine reduction media contributes to the exceptional NSF Certified performance and capacity of OptiPure systems.

 ***Filtering out fine particulates and reducing chlorine is always beneficial for equipment condition and operating efficiency, and ice quality; and is recommended as minimal water treatment for all ice making equipment.***

## **Hardness – (scale / lime-scale)**

**The most common and expensive water related problem with ice makers** 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, along with other dissolved solids, are forced out of water during the freezing process in commercial ice machines. Scale forms as a hard, adherent, rock-like layer on machine surfaces and in water distribution components and fittings. Over time scale build-up reduces energy efficiency, impedes ice production, diminishes beverage quality and eventually causes shut-down requiring expensive service. **It is estimated that 70% of ice machine service calls are due to water-related problems.**

## **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. Additional problems associated with high TDS include cloudy ice and unpleasant taste.

**In addition to water chemistry, the 'type' of ice machine also influences the tendency for scale to become problematic.**

**'Cube' Ice Makers** – Water, contained in a sump, is continuously circulated over a vertical evaporator where it freezes layer-by-layer until cubes are formed. Once formed, the cubes are released (harvested) into a storage bin and the cycle begins again. As the water freezes in a 'cube' style evaporator most of the dissolved minerals are forced out and become concentrated in the water contained in the sump. At a set frequency the sump is 'dumped' which purges the water with concentrated minerals to drain. This is why a 'cube' ice machine uses more water than is required to produce the ice. For example, 100 pounds of ice contains 12 ½ gallons of water, but additional water is used to purge the sump. The amount of water used varies but averages 18 to 20 gallons per 100 pounds of ice produced. Purging the sump removes some of the dissolved solids that would otherwise form scale in the machine.

**'Flake' Ice Makers** – Water is continuously frozen in a barrel-shaped evaporator where it is scraped off by an auger inside the barrel and collected in a storage bin. There is no sump and no dump with flake ice machines. All of the water (12 ½ gallons per 100 pounds of ice) is used to produce ice, and all of the minerals contained in the water are forced out of solution. The precipitated solids remain trapped in the ice or form as sediment and scale in the machine.

**'Nugget' Ice** – is flake ice that is compressed to form nuggets.

## **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 a water analysis.

**Water Hardness (as CaCO<sub>3</sub>)** – 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, 171 ppm of calcium carbonate (CaCO<sub>3</sub>) divided by 17.1 = 10 grains (gpg) 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<sup>+</sup> and Cl<sup>-</sup> ions. Water is referred to as the “universal solvent” because of its ability to dissolve so many different substances. Dissolved ions, such as Na<sup>+</sup> and Cl<sup>-</sup>, make up the majority of TDS in water 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. Alkalinity, when looked at in conjunction with other chemical characteristics, is also an indicator of the potential or tendency for hardness minerals to form scale.

**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, pH 7 is neutral - below 7 is acidic and above 7 is basic or alkaline. High pH indicates a scale forming tendency while low pH can indicate a corrosive tendency.

**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 – [drinktaps.org](http://drinktaps.org)


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

### 1. Inhibit problems with minerals

**Inhibiting technologies do not remove dissolved minerals.** OptiPure's IsoNet® is a patented scale inhibitor technology that interferes with the relationship between dissolved minerals to inhibit the formation of hardness compounds. Minerals are not removed and TDS is not reduced. Inhibiting technologies, such as IsoNet®, dissolve polyphosphate into water to sequester hardness minerals inhibiting their tendency to form scale.

### 2. Remove problematic minerals

**Removal technologies take out dissolved minerals that cause scale.** OptiPure Advanced Membrane Separation (AMS) technologies effectively eliminate problems associated with TDS and water hardness by removing problematic minerals. With the use of reverse osmosis, and mineral addition or blended-filtered water, **OptiPure's (AMS) systems** can produce water with ideal properties for any commercial ice maker application. When warranted, this technology easily pays for itself by reducing service and optimizing ice quality; and extending equipment life.


 **OptiPure's AMS and IsoNet® systems for managing hardness and TDS problems are integrated, multi-stage systems that include particulate filtration and activated carbon for chlorine, taste & odor reduction.**

**OptiPure application recommendations are based upon** a systems tested and proven ability to protect equipment against undesirable water characteristics. It is important to note that water chemistry and the mechanical aspects of cube and flake ice equipment can be 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 equipment and ice (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.

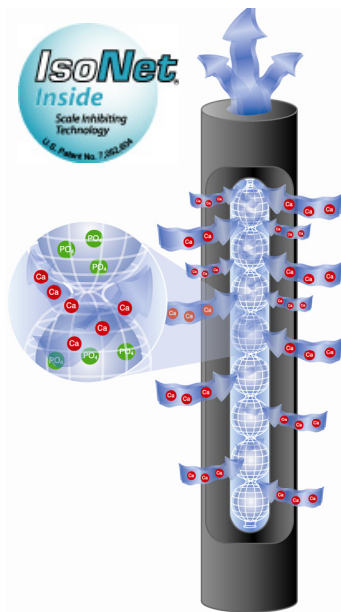
**Application Recommendation**



	Consider when
Hardness	> 50 ppm (3 grains)
Alkalinity	> 50 ppm
TDS	> 150 ppm
pH	7.0 to 9.5

**OptiPure filtration systems with IsoNet® provide balanced protection against water-related problems for cube, flake or nugget ice machine 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 compounds. IsoNet also guards against corrosion.

- **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 FXI and QTI systems with IsoNet® is a proven performer in foodservice establishments throughout North America.**



**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 are Tested and Certified by NSF International.**




**FXI-12**

**QTI-1+**

**Application Recommendation**



	Consider when
Hardness	> 205 ppm (12 grains)
Alkalinity	> 150 ppm
TDS	> 300 ppm
pH	6.0 to 10

**AMS is recommended for ice machine applications with problematic water or where inhibiting technology does not provide needed protection against scale.**

**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 effectively takes out the total dissolved solids (TDS) and ions in water. Water with this degree of purity can be corrosive and does not allow the electrical conductivity needed for level sensors and probes to operate. A typical reverse osmosis system is not recommended for use with ice machine applications.

**OptiPure AMS provides the right water characteristics for ice makers.**

**OptiPure LP and OPW models** utilize special “selective rejection” membranes that remove hardness minerals while allowing some permeation of non-hardness minerals. This allows for needed conductivity and reduces the aggressive nature of pure water. When needed, mineral addition filters are used to provide additional mineral balance for ice equipment.

**OptiPure BWS-QT system** (shown) allows a user to blend Filtered Water with RO Water to achieve “Optimized Water” with a user determined TDS level and mineral balance. Water quality can be adjusted to meet any desired mineral level regardless of geographic or seasonal variations in water characteristics.

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

**AMS is especially beneficial with “flake”, “nugget”, or “pearl” ice used for beverages; and is ideal for combination ice/drinking-water dispensers.**



## **System Selection**

**Once you choose the right water treatment technologies 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.

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 'rated 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 system's '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](http://www.optipurewater.com)

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

