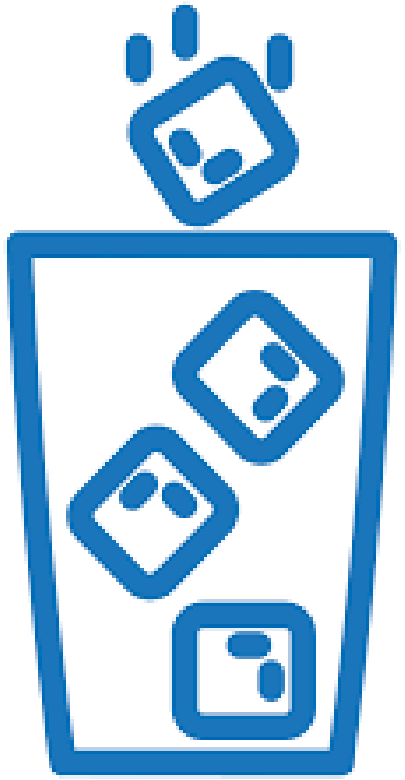
Danamark
WATERCARE

DanaHub Module - Ice

What we will cover in this section

- Types of Ice & Ice Machines
- Ice Machine Operation
- How Water Quality Impacts Ice Machines
- Potential Water Quality Problems
- Selecting the Right Water Filter
- How to Make More Money



Commercial Ice Makers

There are almost 150,000 ice machines sold each year, and industry studies indicate that they have an average life span of 5-7 years. This means that there are almost one million (1,000,000) commercial ice makers in use today.

Ice is required in all foodservice operations to chill beverages, blend cocktails and maintain safe temperatures in salad bars. Grocery and wholesale food outlets also need icemakers for bag ice sales, the chilling of fish, meat and produce displays.

Hospitals and other medical facilities require ice for a wide variety of therapeutic applications. Most hospital floors have at least one ice/water dispenser.

Commercial Icemakers present a significant opportunity for selling water treatment because at least 70% of all ice machine repairs are water related. The correct choice of treatment can address water problems, reduce maintenance cost and extend the life of the ice machine.

Although every manufacturer of commercial icemakers recommends appropriate water treatment, most of the new machines are installed without a filter system.

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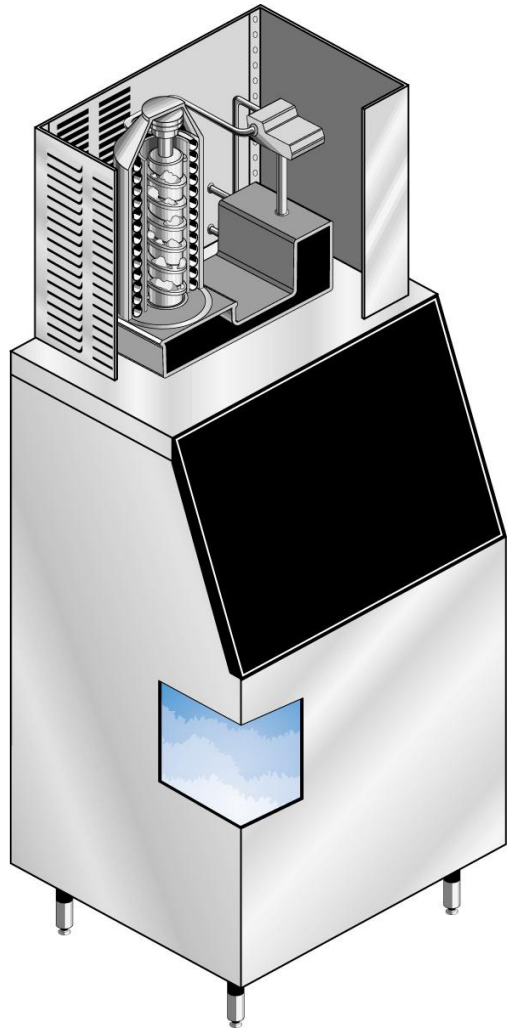
Types of Ice Machines - Flakers

During the first half of the twentieth century, Flake ice machines were the most common type of icemaker. The Flake ice machine produces fine particles of irregular shaped ice, which melt quickly and offer rapid cooling.

Flake ice can be molded to any shape for use in grocery food displays and salad bars, and it is still the preferred form of ice in most hospital / therapeutic applications. Because flake ice melts rapidly, it is not usually recommended for fountain drinks.

To address this limitation, the industry introduced machines which compress the flakes into small, cylindrical, randomly sized bits of ice. Known as *nugget* or *chiplet ice*, the compressed flakes have rapid cooling power but melt more slowly than traditional flake ice.

Nuggets are preferred by some theatres because they are soft enough to eat quietly, and do not leave chunks of hard ice on the floor or in the empty cups. A few fast food chains have also adopted this ice style for carbonated beverages.



Types of Ice Machines – Flakers - Continued

Flake ice machine designs are available in a variety of models and sizes. Small machines produce 200 pounds per day and the larger units can make over 2,000 pounds per day.

The size of each machine is very important to the correct choice of water treatment products. Remember that Flake ice machines convert all water to ice, and there is no waste water with these designs. Since each gallon of water will produce 8.345 pounds of ice, you can quickly calculate the daily amount of treated water required for each machine.

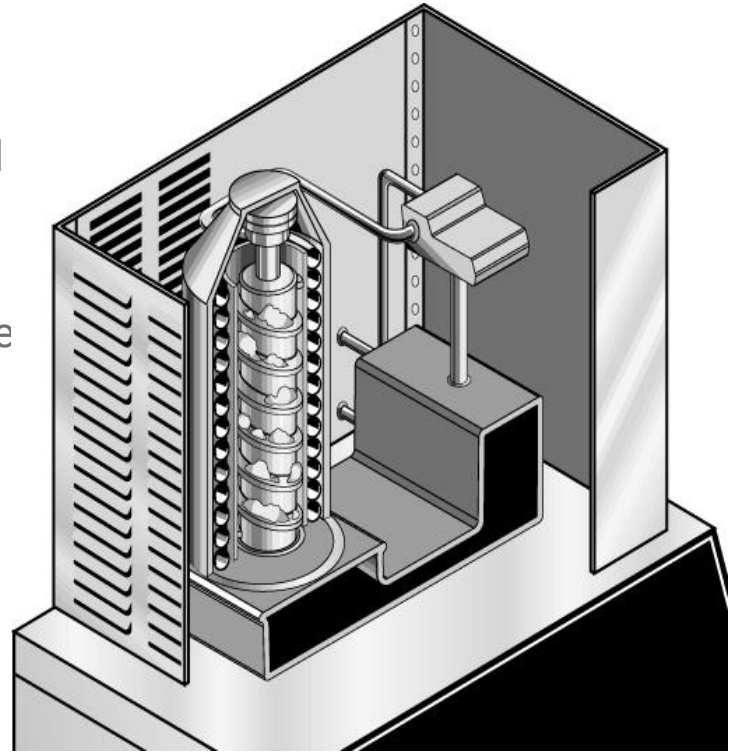
Example: 1,000 lbs. per day = 1000 divided by 8.345 lbs. per gallon = 119.8 gallons of water per day

From this example, we can see that approximately 120 gallons of treated water will be needed for every 1,000 pounds of flake ice (or compressed ice) each day. This information will be very helpful when choosing the correct filtration product, and estimating the service cycles.

How Flakers Make Ice

There are 6 basic steps to complete the process:

1. Water flows through a float or mechanical solenoid into a small sump.
2. Water enters an evaporator chamber, which has refrigerated tubing embedded in the walls of the barrel. Cold refrigerant is pumped through the tubing to lower the temperature and create a freezing surface.
3. As the water cascades down the sides of the barrel, ice crystals form along the cold evaporator walls.
4. The auger (shaped like a large metal screw) slowly rotates and draws the ice crystals up the sides of the evaporator. The upward motion allows the water to drain away, and turn the ice crystals to semi-dry flake ice.
5. The Flake ice is carried to the top of the evaporator and pushed into a delivery chute.
6. The Flake ice falls into an insulated storage bin.



How Water Quality Impacts Flakers

With this design all contaminants that travel with the water into the machine will be trapped in the ice. There is no flush or waste water in the basic flake icemaker. In other words, junk (water) in – junk (ice) out.

Machine operation and efficiency can be affected by many of the same contaminants, along with the issues of mineral scale.

Suspended Solids in the water supply can create several issues:

- Large solids are abrasive and can scratch or score the metal surfaces inside the machine.
- Solids can clog small orifices in the float or solenoid assembly.
- Solids can create cloudy or dirty conditions in the ice.
- Small solids add considerable volume to the mineral scale deposits that form in the machine.
- Some water supplies can include potentially harmful cysts such as cryptosporidium.

Cutter head for fine flaked ice

How Water Quality Impacts Flakers – Continued

Chemicals, such as chlorine, chloramine, organic taste, odour and colour, can create other issues:

- Chlorine and Chloramine can easily convert to gas vapours and combine with water molecules to form mild acids in the ice machine. These acids will corrode the metal surfaces over time.
- The disinfectant chemicals can also attack rubber gasket and seals, creating leaks and operational problems.
- The disinfectant and natural chemicals can cause undesirable taste, odour and colour in the finished ice.

Dissolved solids or mineral content in the water supply can create mineral scale:

- Scale inhibits energy transfer (removing heat from the water), and reduces the efficiency of the ice machine.
- Scale deposits on the evaporator can score the smooth metal surfaces, and create auger damage.
- Continued scale deposits can damage the auger alignment, and create stress on the lower bearing assembly.

Recipe for Mineral Scale

Mineral scale consists of precipitated minerals and small solids. It forms at a point of energy transfer such as the freezing process in ice machines or the heating process in steamers, ware washers and coffee machines. Mineral scale is actually the reforming of rock from its component minerals.

There are three key ingredients for forming mineral scale:

- Calcium or magnesium cations (minerals) with a positive charge.
- Carbonate or sulfate anions (minerals) with a negative charge.
- Small dirt particles and solids.

The scale forms when positive and negatively charged particles are attracted to each other and precipitate. This formation may trap other solids in the process. There are two key conditions for scale formation. The pH level must be neutral or above and there must be an energy transfer to act as a catalyst*.

* A catalyst is an initiator – in this case the catalyst is energy transfer or heating.

Mineral Scale – Equipment Problems

Mineral deposits, such as limescale, are a major headache for food service operators with ice, coffee, espresso, steam and warewashing equipment.

When the temperature of water is raised or lowered, the dissolved minerals begin to “precipitate” or fall out of solution. The components of rock (mineral / ions) start to reform, and this mineral scale attaches itself to the heating elements, reservoir walls, and the sides of metal tubing.

Mineral scale can clog tubing and small orifices, coat heating / cooling elements, and result in increased detergent usage.

Increased operating costs also include the need for deliming – an acid cleaning process that removes mineral scale. This process is harsh to the equipment surfaces and decreases equipment life.

The deliming chemicals can also be hazardous to service personnel and create safe disposal problems.

Reduced Energy Transfer:

- **Scale is an insulator which causes reduced energy transfer & efficiency loss = increased energy demands for cooling & increased operating costs**
- **1/4” Scale = up to 39% loss of energy transfer.**

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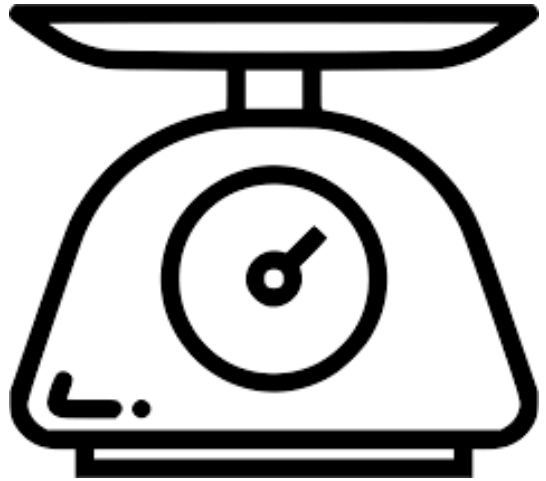
Mineral Scale - Quantity

The following numbers help define the severity of the mineral scale problem or your customers:

- There are 7,000 grains of mineral content in one pound of dissolved rock.
- There are approximately 15 grains per gallon in the average water supplies.
- 467 gallons of this water contains more than one pound of dissolved rock.



From the customer's perspective, with this average water supply:

- Almost 1.5 pounds of dissolved rock will enter a typical 600 pound cube ice machine each week.
- Almost 1.5 pounds of dissolved rock will enter a coffee brewer every 6-8 weeks (15-20 pots /day).

Types of Ice Makers - Cubers

In recent years, the Cube ice maker has become the industry standard for most foodservice applications. Cubes have a specific, clear shape, and are harder than flake or nugget ice. Since the high density of cube ice results in a slower melt, it is recommended for most fountain and bar drinks.

Cube ice is produced in a few basic shapes and sizes, and knowing these forms can be helpful in identifying the manufacturer of each cube ice machine.

For instance:

- Hoshizaki has chosen a crescent shape for cube ice.
- Many models of Scotsman machines produce pillow shaped cubes.
- Manitowoc and Ice-O-Matic machines manufacture rectangular cubes in several sizes.

Hoshizaki Crescent Shape Ice

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Types of Ice Makers – Cubers Continued

Cube ice makers are available in a variety of models and sizes. Small commercial machines produce less than 200 pounds per day and some larger units can make over 2,400 pounds each day.

To accommodate growth or space limitations, smaller machines can also be stacked on top of each other to produce a greater volume of ice in the same storage bin.

The size of each icemaker is very important to the correct choice of water treatment product, but you should also be aware of recent changes in the foodservice industry. The traditional approach used a single, large icemaker located in the back room.

Store personnel loaded and carried large buckets of ice from the storage bin to each dispenser within the restaurant, and refilled the applications as needed during each day. There were frequent opportunities for ice spills, slippery floors, personal injuries, and food contamination within this process.

Scotsman Cube Shape

Types of Ice Makers – Cubers Continued

Today, you may find separate icemakers over each fountain dispensing system in fast food and convenience store locations. These units have limited storage, and are sized to the peak demand during each day. The large, back room icemaker may only be used as an emergency supply

From a water volume viewpoint, there are two basic types of Cube ice machines:

- Low flow machines, which draw less than 1.5 gallons per minute during fill, and send a limited amount of water to drain. This flushing action is designed to rinse the solids and mineral concentrations from the machine after each batch of ice is made.
- Hoshizaki and Kold Draft brands produce high flow machines, based on their belief that aggressive fill and flushing will produce better quality ice, and lower maintenance with each Cube ice machine

Ice-Over Fountain Dispensers

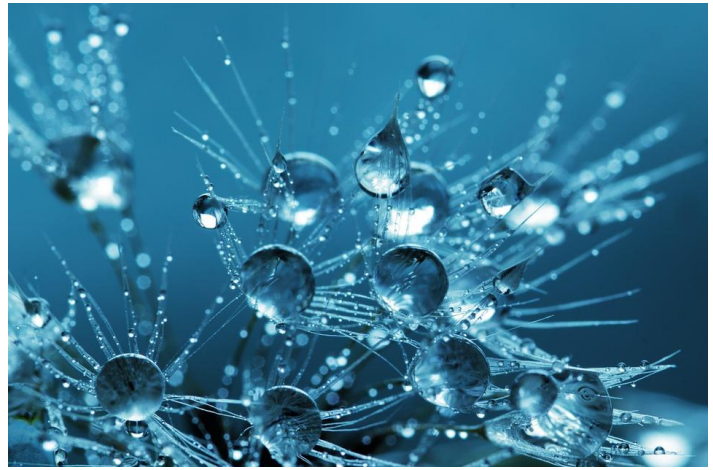
Types of Ice Makers – Cubers Continued

Freezing can be viewed as the process of removing heat from water [Ice = H20 less BTU]. All machines must have a method of releasing this transferred heat into the environment.

The three methods of machine cooling are:

- Water cooled condensers which use a steady flow of cold water to the drain.
- Air cooled condensers and fans which blow extra heat into the kitchen or building.
- Remote air cooled condensers which release heat to the outside of the building.

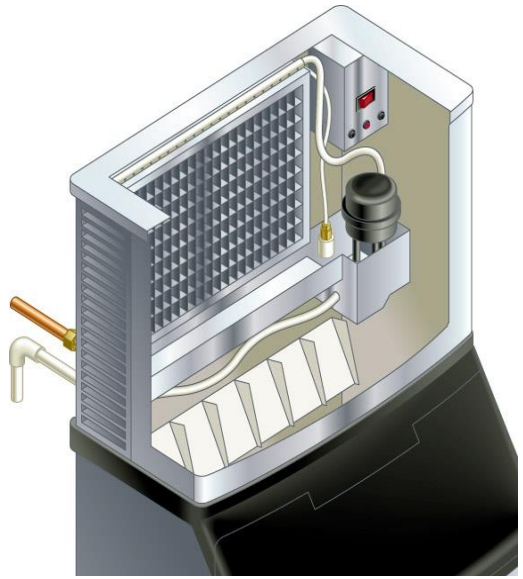
Note: Water cooled machines have a separate plumbing connection for the condenser, which uses a large volume of water every day. This cooling water goes straight to drain after cooling the condenser.



How Cubers Make Ice

There are five basic steps to producing the cubes, with a few variations between equipment brands:

- Inlet water flows through a float or a time controlled solenoid into the sump.
- Water is pumped out of the sump and through the distribution tubes at the top of the evaporator plate.
- The small holes in the distribution tube allow the water to cascade slowly over the evaporator plate. This flowing motion releases some water vapor, which you will notice as a cool mist in the ice machine. The agitation also allows a few chemicals to be released in gas form, and they mix with the water vapor to become mild acids.
- The evaporator plate is imbedded with refrigerant tubing, and cold refrigerant is pumped through the tubing to produce a freezing surface. Some of the water turns to ice on the surface of the small cube grids.
- The remaining water, and most of the dissolved minerals, are pushed away from the freezing surface and return to the sump – to repeat the process until a full ice cycle is completed.



How Cubers Make Ice – Continued

Once the ice is made, there are four more steps for harvesting the ice (harvest cycle):

- When a timer or sensor indicate that ice cubes have reached their proper size, the compressor changes to the hot gas cycle and begins to warm the evaporator plate. At this point, more water may be added to help the cubes release from the grids (harvest assist).
- Cubes release and fall into the storage bin.
- The sump is flushed to discard the solids and mineral impurities.
- The sump is then refilled with fresh water.

How Water Quality Impacts Cubers

Water contaminants can create a variety of problems in Cube ice machines. Remember that the machine is designed to freeze water with the least amount of solids, chemicals, and mineral content, and to concentrate and flush those impurities in a controlled volume of waste water.

It is in this sorting, separating, and flushing process that we find the root causes of icemaker damage.

Suspended Solids in the water supply can create several issues:

- Large solids are abrasive and can scratch or score the metal surfaces inside the machine.
- Solids can clog small orifices in the float, solenoid assembly, and distribution tubes.
- Small solids add considerable volume to the mineral scale deposits that form in the machine.

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How Water Quality Impacts Cubers - Continued

Disinfection Chemicals, such as chlorine and chloramine can create other issues:

- Chlorine and Chloramine can easily convert to gas vapors and combine with water molecules to form mild acids in the ice machine. These acids will corrode the metal surfaces over time.
- The disinfectant chemicals can also attack rubber gasket and seals, creating leaks and operational problems.
- The disinfectant chemicals can cause undesirable taste in the finished ice.

Dissolved solids or mineral content in the water supply can create mineral scale:

- Scale inhibits energy transfer (removing heat from the water), and reduces the efficiency of the ice machine.
- Scale deposits can clog and reduce water movement through float, solenoid, pump, and distribution tubes.
- Continued scale deposits require acid cleaning of the ice machine.

Quick Reference Sizing Guidelines

Here are some sizing guidelines to use when choosing the right water filter:

Answer these questions:

- Flaker or Cuber?
- For Cubers - High Flow or Low Flow ?
- Size of machine (lbs/day)?
- Stacked ice machines?
- Hoshizaki/ Koldraft? (remember they use a lot more water)
- Air cooled or water cooled. If water cooled, is the inlet connection separate?

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Quick Reference Sizing Guidelines - Continued

	Size (lbs/day)	Size (lbs/day)	Size (lbs/day)	Size (lbs/day)
Flaker (up to)	1,500	3,000	5,000	7,000
Low Flow Cuber (up to)	750	1,450	2,400	3,600
High Flow Cuber (up to)	200	450	900	2,000
Filter	Insurice 2000 Single	Insurice 2000 Twin	Insurice 4000 Triple	Insurice 4000 Quad
Max Flow Rate	1.67 gpm	3.34 gpm	5.0 gpm	7.3 gpm

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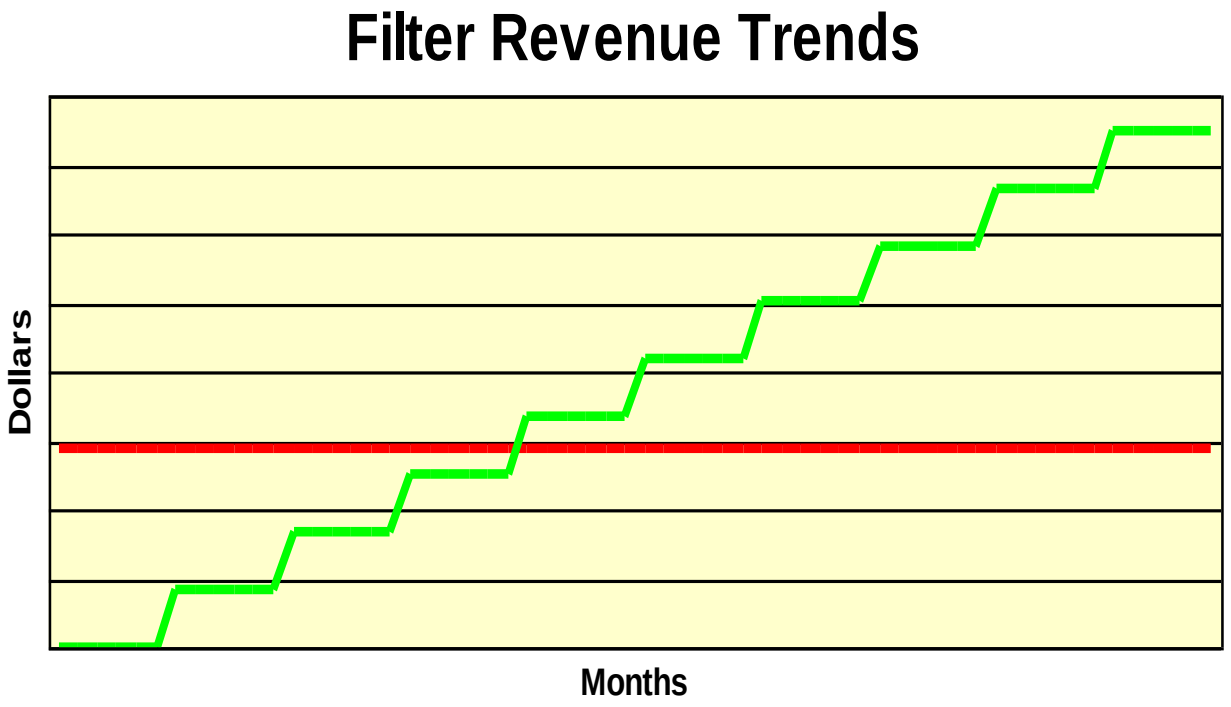
Profit Opportunity



One new filter system sale per month yields increasing cartridge changes over the years, ensuring a steadily growing revenue stream

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Profit Opportunity

We refer to Everpure products as ‘backward compatible’ which means that all our replacement cartridges fit into existing Everpure hardware regardless of when it was purchased. The universal design of the filter head/heads means your customers can enjoy new technology cartridges as they are introduced and you have lots of options in your ‘toolkit’ to address their needs in the future.

In addition to the ongoing revenue stream associated with selling water filtration systems, Everpure offers a broad range of ‘upgrades’ in the form of higher capacity cartridges, should you need longer life. Problem solving cartridges for problematic water and even shorter cartridges should you be tight on space.

By keeping track of your system sales and scheduled cartridge changes, and providing your customers with a planned PM programme, you can build a nice business that will only grow year over year.

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Importance of NSF Certifications & Food Safety

The National Sanitation Foundation (NSF) is an independent third party certification organization. Drinking Water Treatment units are voluntarily submitted for certification. Everpure has the most certified products on the market today.

NSF/ANSI Certified Drinking Water Treatment units undergo the following testing:

- Extraction testing to ensure that wetted parts do not leach contaminants
- Structural Integrity testing
- Literature review to ensure honest and accurate product performance claims
- Performance testing against specific contaminants, per the NSF/ANSI Standard.

Look for the NSF Mark:

- NSF/ANSI Standard 42 certifies aesthetic claims, which include mechanical reduction of solids and reduction of chlorine.

- NSF/ANSI Standard 53 certifies health claims. NSF/ANSI Standard cyst reduction certification requires 99.95% or greater of cysts removed.

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Protecting Ice Making Equipment is as easy as 1,2,3

1) Install the proper Watercare Equipment

2) Assure results with the proper installation

3) Establish a Preventive Maintenance Schedule & Stay on Schedule!

Establishing Regular Preventative Maintenance (PM) with the customer and replacing filter cartridges when needed, is of paramount importance.

Preventative maintenance can be assured by scheduled automatic service calls, auto ship programs or by sending automatic reminders to the customers.

Remember: S I R - Select - Install - Replace

Is the key to providing quality, protecting equipment and selling filters.

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Recap

WaterCare is a great business to be a part of…it benefits your customers and their operations and it provides you with a new revenue stream.

Water filters pay for themselves through:

- Customer satisfaction by delivering consistently high quality water, day in and day out
- Reduced emergency maintenance, wear & tear on equipment
- Extended equipment life, less deliming with harsh chemicals
- Peace of mind –water is food and food safety is everything (NSF Certification)

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Thank you for your time.

This concludes our DanaHub Module on Ice Making Equipment

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