



# Commercial Kitchens Water Use Efficiency and Best Practices Guide

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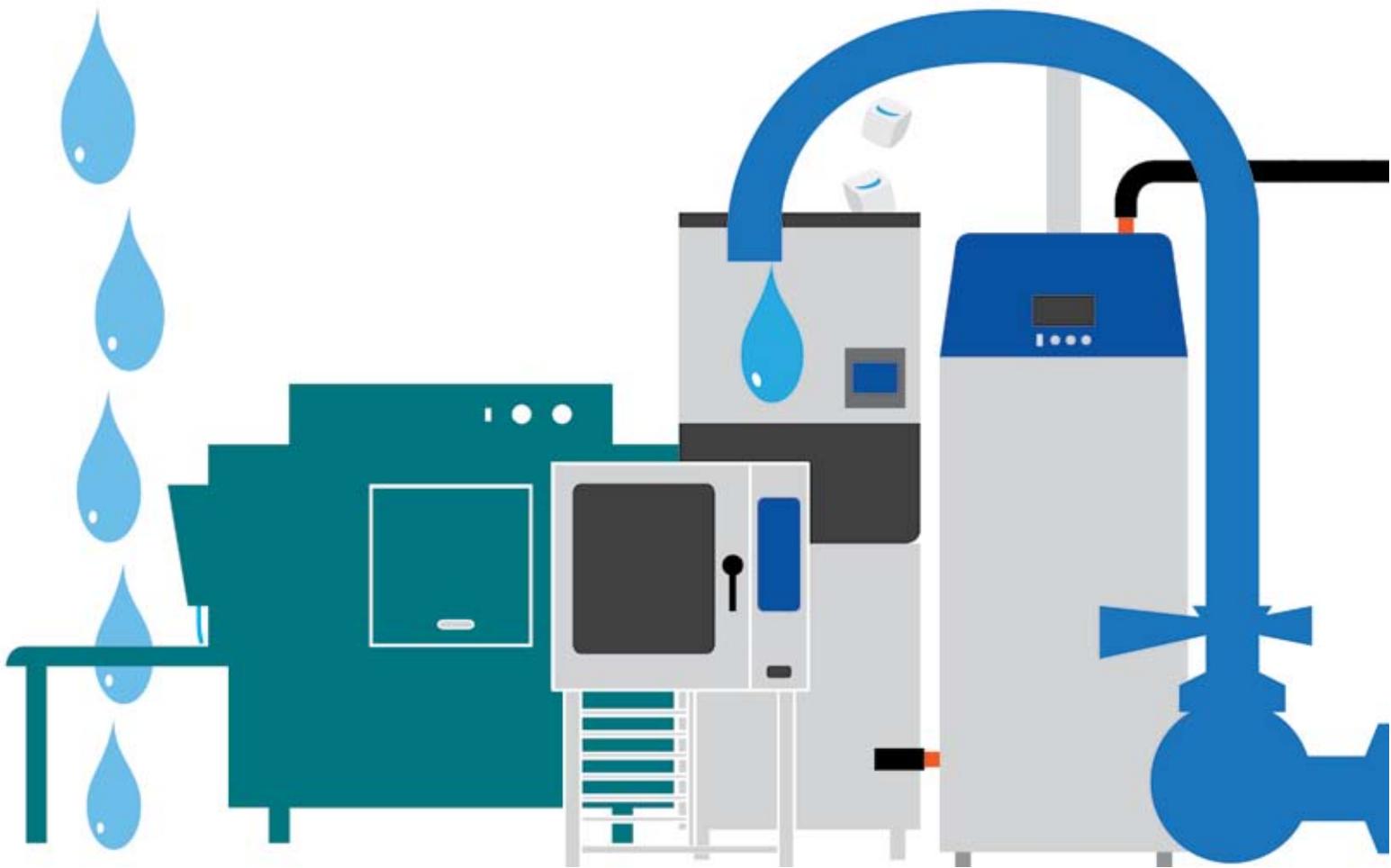
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## In This Guide

You will find operational best practices, technology applications, and real-world case studies — information that can help significantly lower the water waste in your commercial kitchen.



## Introduction To Water Conservation

In every commercial kitchen, water is an essential ingredient used in cooking, cleaning, and sanitation. And, like other ingredients, water is a commodity that has to be purchased. Because water has been reasonably priced for many years, most commercial kitchen managers don't treat water purchases with the same oversight as other commodities like food and beverage. The result is that water is routinely wasted in large quantities in almost every operation, from the smallest cafe to the largest restaurant.

Considering that water rates are expected to rise anywhere from 5 to 15% every year on average across the U.S.<sup>1</sup>, wasting water is becoming a bad business practice that negatively impacts your bottom line.

The good news is that water utilities are now establishing major campaigns to educate users on water conservation and the public is putting more pressure on businesses to operate in a more environmentally friendly manner. For commercial kitchen operators, there are many cost-effective strategies to curb water waste without reducing food quality, equipment performance, kitchen cleanliness, or the overall customer experience.

Rate increases are region dependent

- 1 <http://usatoday30.usatoday.com/money/economy/story/2012-09-27/water-rates-rising/57849626/1>
- 2 Delagah, Amin and Fisher, Don. 2008. Water Heating Equipment and Systems Characterization: Heating Load and Energy Efficiency Potential in Food Service Facilities. California Energy Commission, PIER Energy-Technologies Program. CEC-500-06-028.
- 3 Based on FSTC Monitoring of 3 retail locations in the San Francisco Bay Area.
- 4 <https://water.usgs.gov/edu/earthhowmuch.html>
- 5 <http://www.gao.gov/assets/670/663344.pdf>
- 6 [http://fishnick.com/design/waterheating/Water\\_Heating\\_Design\\_Guide\\_Final.pdf](http://fishnick.com/design/waterheating/Water_Heating_Design_Guide_Final.pdf)

## DID YOU KNOW?

According to a California Energy Commission study, full service restaurants were estimated to use approximately 2,500 gallons of hot water daily!<sup>2</sup> If you add in the cold water – a restaurant will typically use about 5,800 gallons of water a day – depending on its size, the volume of customers, its equipment, and the age of the building.<sup>3</sup>

Only 3% of the world's water is freshwater. The remaining 97% is saltwater.

Of the freshwater on earth, less than one percent of it is available to humans. This is because most freshwater is trapped in glaciers, ice caps, and groundwater.<sup>4</sup>

“According to state water managers, experts, and literature U.S. Government Accountability Office reviewed, freshwater shortages are expected to continue into the future. In particular, 40 of 50 state water managers expected shortages in some portion of their states under average conditions in the next 10 years.”<sup>5</sup>

“Foodservice operations in California consume upwards of 350 million therms of gas annually for water heating – representing 15% of the total gas consumed by commercial buildings in California.”<sup>6</sup>



# Conserving Water in the Restaurant – Why Bother?

## Top Reasons to Make the Effort to Conserve

### 1. Reduce Your Bills

Reducing your kitchen's water consumption will not only bring savings to your water bills, but savings in hot water will have a direct effect on your kitchen's energy consumption. In a typical kitchen, overall water savings of 10–25% can be achieved with low cost or no cost upgrades, behavioral changes, and minor investments.<sup>7</sup> Doing something that's as easy as installing a 0.5 gallon per minute aerator on a lavatory sink can save 19,602 gallons a year and \$23 annually in water costs.<sup>8</sup>

### 2. Rising Water Cost

Investing in efficiency helps offset increasing water and sewer costs, which are rising faster than inflation. Nationwide, water costs are rising an average of 6% per year.<sup>9</sup> In certain regions, commercial water rates may be as much as \$23 per 1000 gallons for foodservice facilities.<sup>10</sup>

### 3. It's a Good Investment

The great thing about conserving water and energy is that you can use the money gained from those savings to then invest further in some of the longer term or more expensive conservation measures (like buying a new, more efficient appliance, replacing a toilet, etc).

### 4. Promote Sustainability in our Industry

As an industry, we have significant savings potential if restaurant operators make an effort to conserve. For example, if just 5,000 full service restaurants in the U.S. reduced their water consumption by 10% they would collectively save about 2,900,000 gallons of water a day – which is over 1.05 billion gallons annually. Those savings could supply over 29,000 Americans with water for an entire year!<sup>11</sup> Plus, those restaurant operators would collectively save over \$11,962,500 per year.<sup>12</sup>

### 5. Help Tackle this Global Issue at the Local Level

Kitchen operators have a real opportunity to make a significant impact on water supplies around the country and around the globe. When you reduce demand on water locally, you reduce the environmental impacts associated with water treatment and sewage systems – reducing the energy used to transport and treat water, and lessening the impacts on local watersheds and wildlife habitat.

<sup>7</sup> Estimated range of potential savings based on FSTC field auditing and monitoring experience.

<sup>8</sup> Assuming a former flow rate of 3.2 gpm, daily use of 20 minutes for 363 days annually and a combined water/sewer cost of \$8.5/CCF.

<sup>9</sup> Black and Veatch, 50 Largest Cities Rate Survey 2016, [www.BV.com](http://www.BV.com)

<sup>10</sup> 2016 San Francisco municipal water rates. (available at: <http://www.sfwater.org/index.aspx?page=170>)

<sup>11</sup> Assuming 100 gallons /day per American for 365 days/year (EPA Water Sense; [www3.epa.gov/watersense/about\\_us/facts.html](http://www3.epa.gov/watersense/about_us/facts.html))

<sup>12</sup> Calculation based on these assumptions: 5,800 gallons/day per restaurant for 363 days/year at a rate of \$8.5/CCF (1 CCF = 748 gallons).

# Understanding the Numbers

## Measuring Water and Energy

To begin, let's discuss some of the terms used to measure water consumption and how your utility company bills you for that water.

### FLOW RATE

“Flow Rate” refers to the maximum amount of water that can flow through a device in a specific time frame measured in **gallons-per-minute (gpm)**. For example, a typical hand sink may be fitted with an aerator that is rated 2.0 gpm.

Sometimes, the gpm rating is visibly etched onto the device as in the case of aerators. But often times as with some pre rinse spray valves or hoses it is not.

In order to benchmark your current flow rates and project potential savings, you might need to measure the flow rate, using a stop watch and gallon pitcher.

You can also check with your local water utility to see if they provide easy to use flow-rate measuring bags that do the calculating for you. Or they may even provide free site auditing services in which a technician comes to your restaurant to assess your water consumption!

### WATER ACCOUNTING

- Quantities of water are typically billed based on units of 100 cubic feet CCF , which equals 748 gallons. **Many utilities also bill in thousands of gallons.**
- Every drop of water you consume is actually being billed twice. Water utilities have separate rates for the incoming potable water and the outgoing wastewater. However, both quantities are being measured at the same incoming water meter just remember that “water in” equals “water out” and sewer costs are typically more than potable water costs.\*
- For our water cost calculations, we will assume a charge of \$ 3.50 for a unit of water and \$ 5.00 for the associated sewer charge, for combined water/sewer cost of \$ 8.5.\*\* That translates into a little over a penny a gallon. A good exercise is to divide your total water bill by your number of transactions to calculate your dollar per transaction cost.

\* Because wastewater requires additional treatment and discharge, you will typically be billed more for the sewer charge than for the water itself.

\*\* Black and Veatch, 50 Largest Cities Rate Survey 2016, www.BV.com

## HOW TO MEASURE YOUR FLOW RATE

1

Grab a gallon-sized pitcher (or container that has a one gallon mark) and a stopwatch.

2

Start recording time with the stop watch as you simultaneously turn on the fixture.

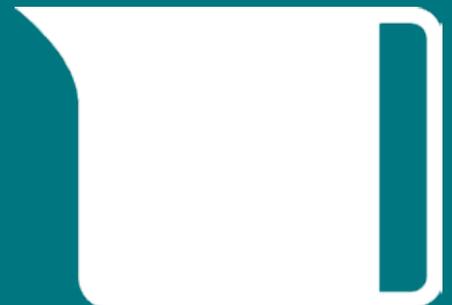
3

Stop recording time when the water hits the one gallon mark.

4

Calculate the gpm with the following formula:  $\text{gpm} = (60/\text{number of seconds you measured}) \times 1 \text{ gallon}$ .

For example, if it takes 30 seconds to fill a 1 gallon pitcher:  $(60/30) \times 1 = 2 \text{ gpm}$



## ENERGY ACCOUNTING

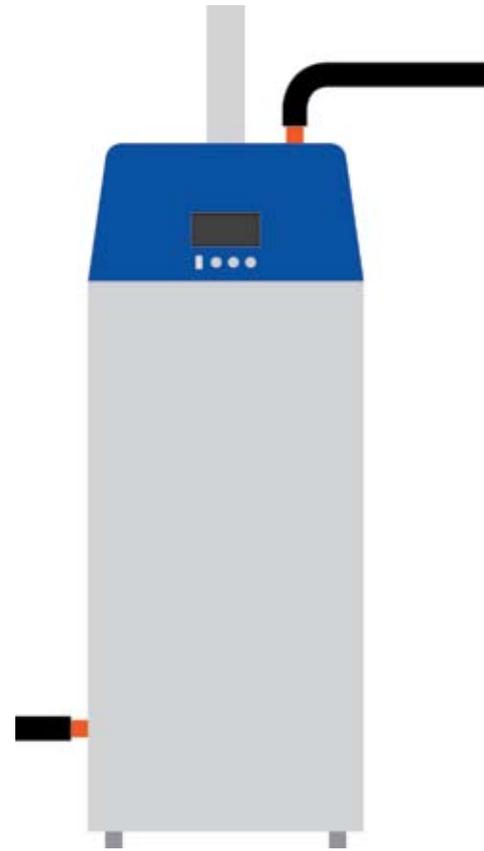
The amount of energy you use will be measured and billed in units of “kilowatt hours” kWh for electricity and “therms” for natural gas.\*

- Electricity prices vary dramatically across the country, but for examples in this guide, we will assume a rate of 0.11 for each kWh consumed.
- Natural gas prices are generally more uniform from state-to-state. We will assume an average of 1.00 per therm for examples in this guide.
- You can adjust the water and energy cost estimates presented in this module based on your own utility rate.

## HOT WATER

Every drop of hot water is billed three ways: water, the energy to heat the water, and sewer charges. You’ll learn in the upcoming sections that the best places to conserve hot water are in your dish room and sinks; their hot water supplies come from your water heater, which uses either gas or electricity to heat the water see ‘water heaters’ page 27 .

In full service and institutional kitchens with dish washing operations, the water heating load can represent up to 20 percent of the total energy use and up to 50 percent of the total gas consumption for the facility.\*\*



## SPECIFICATIONS AND LABELING PROGRAMS

### WaterSense®

This Environmental Protection Agency (EPA) program is designed to promote water efficiency and encourage manufacturer innovation through its special branding of water efficient consumer products. The EPA develops specifications for water-consuming products such as toilets, urinals, and pre-rinse spray nozzles amongst many others. If the product meets these specifications for efficiency and performance through third-party testing, it earns the WaterSense® label. Specify WaterSense® products whenever possible.



### ENERGY STAR®

The EPA created the ENERGY STAR® program to help consumers easily identify energy efficient products, homes, and buildings through its renowned bright blue ENERGY STAR® label. For the purposes of this guide, ENERGY STAR® labeling is crucial when specifying energy-efficient steam cookers, combination ovens, dish machines, and ice machines. The EPA’s ENERGY STAR® specifications also include water consumption limits for these appliances. As you will learn from this guide, water and energy efficiency often go hand-in-hand. Choosing an ENERGY STAR® certified appliance is the easiest way to save water and energy in your restaurant.



\* In some cases, gas utilities bill based on cubic feet (CF) of gas consumed.

\*\* <http://www.energy.ca.gov/2013publications/CEC-500-2013-050/CEC-500-2013-050.pdf>



# Get Started

## Track Water Use

### FIND THE BASELINE

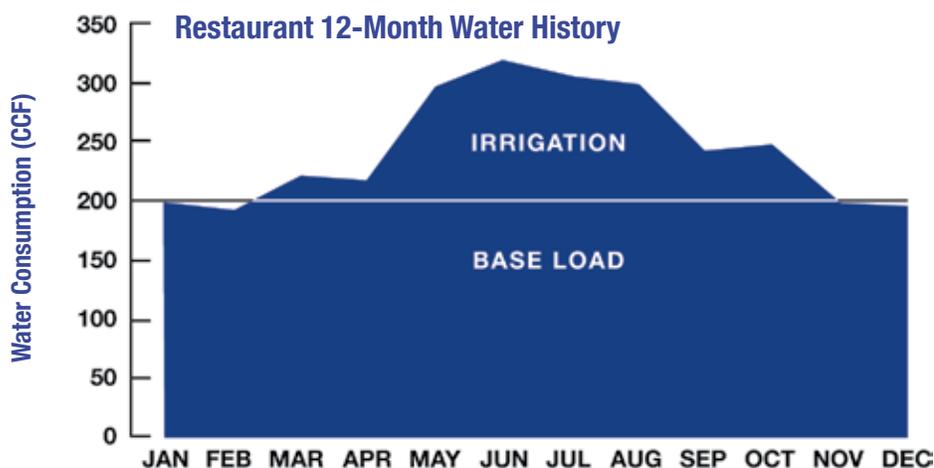
The first step toward reducing water consumption in your operation should be “base lining” or tracking your current usage.

Without tracking your current water consumption, you cannot measure (or celebrate) the efforts that you have made to conserve water.

Tracking water usage also helps you:

- Ensure correct billing.
- Identify anomalies in water usage including leaks, open valves, broken equipment, cracked pipes, etc.
- Identify opportunities for improvement and water conservation.
- Manage utility costs and save money.
- Manage staff behavior of equipment usage.

*Remember, every dollar that you save on your water bill is a dollar that goes right to your bottom line profit.*



### REMEMBER:

*What gets measured gets managed.*

### NOTE:

Tracking water bills also helps you determine seasonal water use for irrigation.





## BENCHMARK YOUR WATER USE

Do you operate several restaurants that are similar to each other? Benchmarking the water use of your restaurants is a powerful tool for locating and reducing water waste. Calculate and compare the dollar per transaction costs described on page 7 for each of your restaurants and note the ones with the highest costs. Do a water assessment or “audit” of the most expensive facilities. Find and correct any water waste and see how that is reflected on your water bills. Continue to benchmark your operations to make sure that your water savings are permanent.

## DOES YOUR OPERATION SHARE WATER COSTS WITH OTHER TENANTS?

If your restaurant is part of a multi tenant property which shares water costs, inquire with your landlord and water utility about possibly sub metering in order to track water consumption most accurately in your restaurant.

## WHAT YOU CAN DO

### **Utility Company Assessment:**

Contact your local water utility to inquire about an audit at your facility. The survey should include a thorough examination of your water use including, refrigeration, sanitation equipment, cooking equipment, irrigation, etc. Local utilities often provide audits for free, but you can hire a third party to conduct an audit as well.

### **Do-It-Yourself (DIY) Assessment:**

If for some reason the options above won't work for you fear not! Although a professional assessment is recommended, after reading this guide you will have all the tools you will need to perform your own basic water assessment and identify savings opportunities.



# The Low Hanging Fruit

## Perform an Assessment

Leaks can occur anywhere throughout the water distribution system, including faucets, toilets and pipes, kitchen equipment, HVAC, and swamp coolers. The amount of water may seem insignificant, but it adds up to gallons and dollars in just a short period of time.

The bottom line is: water leaks are a drain on your profits and should be a priority maintenance item in every restaurant.

To find specific “Common Leaks” outlined in the chart below – it simply takes a visual inspection of the equipment and fixtures listed, combined with following the tips under “What Can You Do.”

## DID YOU KNOW?

At one drip per second, a faucet can leak over eight gallons a day. That’s 3,000 gallons per year.<sup>13</sup>

A light stream of leaking cold water at about 0.1 gpm, which is about six gallons an hour, will add up to over 50,000 gallons, by year-end, and cost you almost \$600 in water alone.<sup>14</sup>

<sup>13</sup> [http://water.epa.gov/learn/kids/drinkingwater/water\\_trivia\\_facts.cfm](http://water.epa.gov/learn/kids/drinkingwater/water_trivia_facts.cfm)

<sup>14</sup> Calculations based on a combined water/sewer cost of \$8.5/CCF

## MOST COMMON LEAKS

TYPE OF LEAK	EQUIPMENT OR FIXTURE	AREA	DIY OR PRO?
Toilet flapper/tanks	Toilet	Bathrooms	Both (depends on leak) Note for DIY: Use correct flapper kit for toilet. Check manufacturer specifications.
Faulty valves	Dish machine, espresso machine, coffee brewer, steamer, irrigation sprinkler valve, swamp coolers	Kitchen, bathroom, utility room, outside	Machines typically need service people, but replacing a washer or gasket or tightening a connection or valve can be DIY if you are handy.
Hose-pipe connections	Irrigation system, mop sink	Janitorial closet, outside	DIY if it is visible and you are comfortable. Note: Sometimes you can simply apply Teflon “plumbers tape”
Broken/worn gaskets/washers	Hand sinks, utility sinks	Kitchen, bathroom, utility room	DIY if you are comfortable.
Temperature pressure release valves	Water heater	Basement, utility room	Contractor/plumber



Use a Drip Gauge to measure water wasted by dripping fixtures.

## NOTE:

Even if you don't see any abnormalities in your water bill, that doesn't mean you don't have any leaks. You should still conduct a walk-through assessment of your facility quarterly.



## STOP LEAKS

### ✓ WHAT YOU CAN DO

- Pay special attention to your monthly bills – a great indicator of a leak is seeing any significant rise in your monthly water bill.
- Set up a quarterly reminder on your calendar to go check the faucets, toilets, hose/pipe equipment connections, etc., as listed in the Most Common Leaks chart.
- Use a handy tool like a drip gauge to easily estimate the amount of water wasted by a leak daily and annually. You can typically get a drip gauge online or for free from your utility.
- You can also estimate the cost of a leak using the Food Service Technology Center FSTC handy Leak Cost Calculator: <http://fishnick.com/savewater/tools/leakcalculator/>
- Check if your toilet is leaking – A “running” toilet – the type of leak that you can hear – can waste up to two gallons of water per minute. This is easily identified and can be fixed. But did you know that toilet leaks can also be silent and may run undetected for months?
- A silent leak can waste up to 7,000 gallons of water per month. To find silent leaks, you can put food coloring in the tank. Then do not flush. After ten minutes, check the toilet bowl. If you see color in the bowl, the tank has a silent leak.<sup>15</sup>

## REAL WORLD STORY

One cafe and teahouse owner from Oakland, CA, was monitoring her water bills carefully when she noticed an unusual spike in water consumption. Suspecting that it may be a leak, she checked all the key areas in the dish room and kitchen and eventually determined that a toilet in the restroom was leaking.

After fixing the toilet, she saw that the water bills returned to their normal usage patterns. That single toilet had cost her an extra 400 in a single bill.

<sup>15</sup> <http://www.ebmud.com/environment/conservation-and-recycling/watersmart-tips>

# Practice Smart Habits

## Daily Do's and Dont's

Informing your staff on more efficient uses of water is virtually FREE and can significantly impact a restaurant's water usage.

### DO:

Manage dipper wells wisely. Turn them on only at first order, monitor their flow-rate, and turn them off when not in use. (See Dipper Wells section for more details and tips .

### DON'T:

Wash a dish rack that's partially full. Fully load every rack you put in your dish machine. Also make sure to soak pots and pans and scrape dishes and cookware before washing.

### DO:

Conserve drinking water: Many restaurants already only offer water to customers upon request. If this describes your restaurant bravo. For those quick-service restaurants, consider offering a water pitcher or tap water with reusable cups.

### DON'T:

Thaw frozen products under running water. Put them in a reach in refrigerator instead. It may take some forethought, but can easily be incorporated into the regular tasks of the closing shift the day prior. Don't wait to thaw till the last minute!

### DO:

Hand scrapping with a wet rag or a plastic scraper to remove large food particles, follow with a low flow pre-rinse spray valve before running through the dish machine.

### DON'T:

Wash veggies and fruit under running water. Rinse them with a low flow pre-rinse spray valve, if necessary, and use a basin or large bowl for the final wash.



### NOTE:

Offering bottled water does not seem to be a viable solution for conserving water. According to [thewaterproject.org](http://thewaterproject.org), it takes three liters of water to produce one liter of bottled water.<sup>16</sup> Bottled water also creates some serious waste problems, so it's best to avoid them if at all possible.



<sup>16</sup> [http://thewaterproject.org/bottled\\_water\\_wasteful.asp](http://thewaterproject.org/bottled_water_wasteful.asp)



# Where the Rubber Meets the Road

## Efficient Strategies for the Most Common Water-Using Equipment

### EFFICIENT EQUIPMENT

The FSTC conducted comprehensive site monitoring and auditing of two California stores of a coffee chain, where cold and hot water consumption at the individual water use points were measured. The total savings potential was impressive:

**Between the two locations, they found that there was the potential to reduce annual water use by up to 110,000 gallons, saving \$1,250 a year on water costs.<sup>17</sup>**

Some of the solutions that the FSTC identified to save water and energy while improving hot water delivery in these two restaurants included:

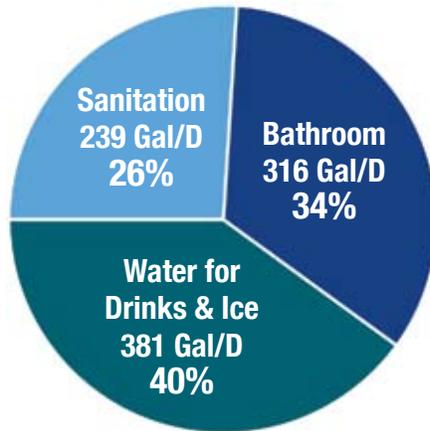
- Retrofit dipper wells by installing a metered faucet  
29,000 gallons per year
- Install a one gallon-per-flush pressure-assist toilets in all restrooms  
34,000 gallons per year
- Install a water and energy efficient ENERGY STAR® ice machine  
5,500 gallons per year
- Install a high-efficiency reverse osmosis system  
36,000 gallons per year
- Install a water and energy efficient ENERGY STAR® dish machine  
5,500 gallons per year

**How can your restaurant see similar savings?** Simply by incorporating a combination of behavioral changes and some of the conservation and upgrade measures outlined on the following pages.

<sup>17</sup> Savings results taken from a 2009 FSTC Water System Monitoring Study of 2 retail coffee chain locations in the San Francisco Bay Area.

## INDOOR AVERAGE DAILY USE

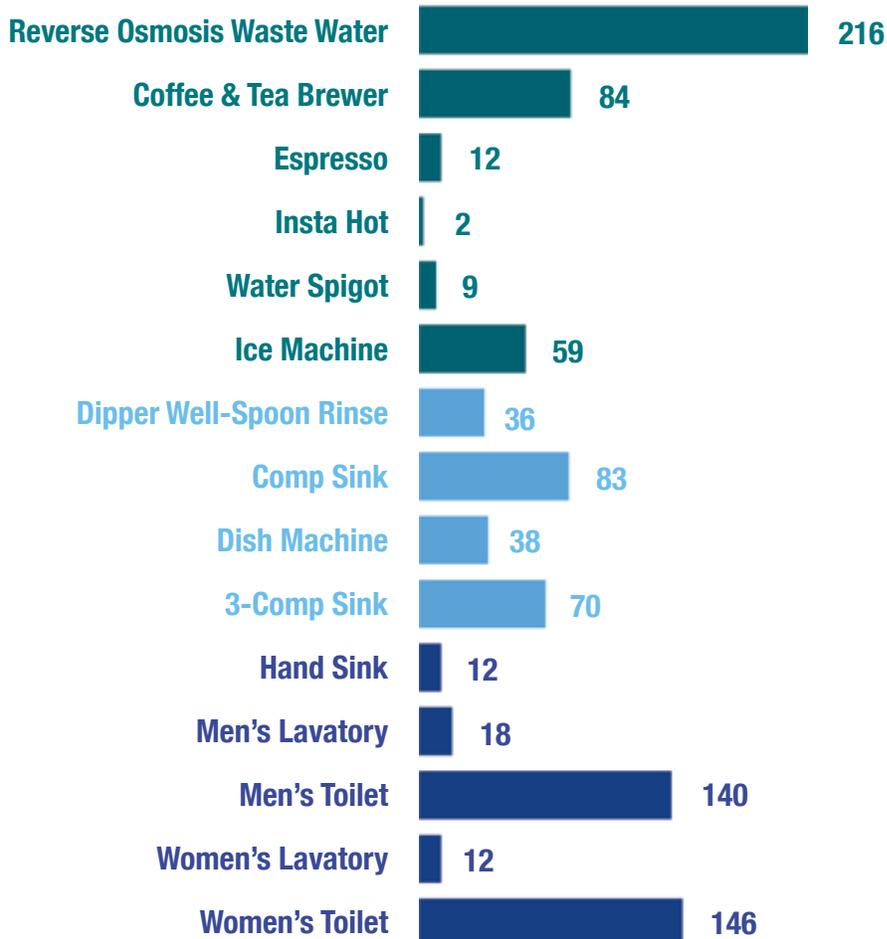
The FSTC divided water consumption into three main uses. These numbers represent areas in a cafe or quick service restaurant that have water saving potential.



### TIP:

*Put up a clear sign explaining how your restaurant is committed to conserving water.*

### Average Daily Water Use by End Use (Gal/Day)



## DID YOU KNOW?

- Some cafes, juice shops, and ice cream parlors have dipper wells that can flow as much as one gallon per minute (gpm) of water. Most of these dipper wells are run at full flow rate and are left on all day, every day.
- At 0.5 gpm running 24 hours per day and 365 days per year, a cold water dipper well wastes around 260,000 gallons of water and racks up \$3,000 in combined water/ sewer costs annually.<sup>18</sup>



## DIPPER WELLS

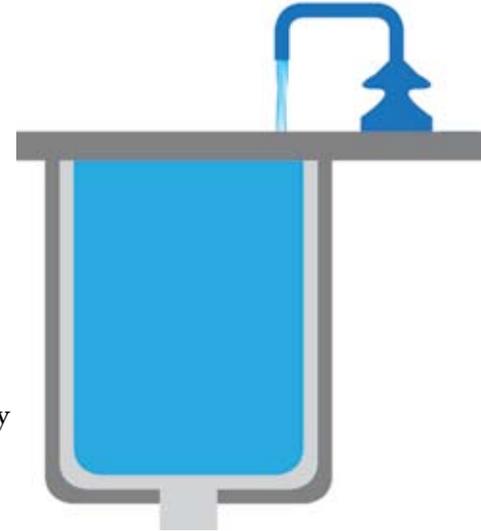
### ✓ WHAT YOU CAN DO

Install a flow-restrictor before the main valve so the dipper well flows at 0.1 gallons per minute (gpm). By reducing the flow rate from 1.0 gpm to 0.1 gpm you can save roughly 5,400 in water/sewer costs per year.<sup>19</sup>

### ELIMINATE YOUR DIPPER WELLS

Unless your operation needs the dipper well for a specific food service function, such as scooping foamed milk or ice cream, it may not be necessary at all.

- Check with your health inspector about regulations regarding keeping spoons in a container of water, and having staff routinely change out that water.



## REAL WORLD STORY

Starbucks reduced their water use by over 15% in company owned stores across the U.S. when they converted their dipper wells to a hand metered water system.

These manual faucets consist of a spoon rinse sink under a metered faucet with a spring loaded head that is depressed by hand to dispense water for a set period of seconds to provide the barista adequate time to rinse spoons and other small wares. The rinsed items can then be reused and re rinsed for a period of two to four hours based on company and local county food safety guidelines.

<sup>18</sup> Calculations based on combined water/sewer cost of \$8.5/CCF

<sup>19</sup> Calculations based on combined water/sewer cost of \$8.5/CCF

## HAND SINKS



### WHAT YOU CAN DO

#### Install low-flow aerators on kitchen and restroom faucets.

- Hand sinks are often equipped with 2.2 gpm aerators. Upgrading to 0.5 gpm aerators in all of your sinks can save as much as 1.7 gallons of water per minute, per faucet. With only 20 minutes of use daily, that adds up to an annual savings of 12,300 gallons and 140 per faucet.<sup>20</sup>
- Most aerators cost less than 10 and are sometimes free from your water utility. They're easy to get at any hardware store and you can install them yourself.<sup>21</sup>
- Your health inspector may require you to install an aerator with a flow-rate higher than 0.5 gpm if it takes too long for hot water to reach the faucet. Health codes take priority so use the lowest flow-aerator you can while fully satisfying the environmental health requirements.

#### OPENING A NEW RESTAURANT?

If so, make sure to start your business with water efficient lavatory sinks by installing aerators and one of the following:

#### Hands Free (foot or knee activated) Sinks for Back of House:

Studies have shown that human controlled flow actually tends to be more efficient than automated faucets. We typically don't open the valve all the way, and we tend to shut off the water immediately after use.<sup>22</sup>

**Automated Faucets** such as motion sensor faucets or metered faucets for customer restrooms: These are also a good option as these types of devices can cut down on germ contact and potentially conserve water.

#### Comparison of Different Aerators\*

Annual Utility Cost	Flow Rate
\$182	2.20 Standard Private
\$124	1.50 Low Flow
\$83	1.00 Low Flow
\$42	0.50 Standard Public
\$29	0.35 Ultra Low

\* 20 minutes of daily use, 365 days per year and a combined water/sewer rate of \$8.5/CCF

20 [http://www.allianceforwaterefficiency.org/Faucet\\_Fixtures\\_Introduction.aspx](http://www.allianceforwaterefficiency.org/Faucet_Fixtures_Introduction.aspx)

21 [http://www.allianceforwaterefficiency.org/Faucet\\_Fixtures\\_Introduction.aspx](http://www.allianceforwaterefficiency.org/Faucet_Fixtures_Introduction.aspx)

22 Savings calculations based on 363 days of operation per year and a combined water/sewer rate of \$8.5/CCF

23 If you already have an aerator on your sink and can unscrew it, bring it to the store with you to make sure you select a new ultra low-flow aerator with the correct threading

## DID YOU KNOW?

Federal law requires that new lavatory faucets not exceed a flow-rate of 0.5 gallons per minute (gpm), but many faucets are still installed with 2.2 gpm aerators. Kitchen sinks are routinely found with no aerators and can have nominal flow-rates as high as 5 gpm.<sup>23</sup>

**What are Aerators?** They're small devices that attach to faucets to reduce flow rates. Aerators often make water flow more forcefully, providing more effective wetting and rinsing. And the best thing about them is that they're inexpensive.



## FIELD STUDY

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### PRE-RINSE SPRAY VALVES

Pre rinse spray valves (PRS) are highly useful devices that knock food particles off dirty dishes before they run through the dish washing machine.

The EPA's WaterSense® program recommends a low flow PRSV with a flow rate of 1.28 gpm or less. Don't worry – these low-flow spray valves blast your dirty plates with a higher pressure water stream than a high-flow valve, so the cleaning performance can be as good or even better than the high-flow units. In short: this means that your water savings will not impact your dish cleanliness performance.



#### WHAT YOU CAN DO

**Install low-flow PRSV with a flow rate of  $\leq 1.2$  gpm.**

This is one of the easiest actions you can take to save water and see a quick return on investment.

#### DID YOU KNOW?

Replacing a 2.5 gallon per minute nozzle with a more efficient model that flows 1.2 gpm can save as much as 28,000 gallons (37 CCFs) of water and 200 therms of natural gas, equating to \$550 in annual water and energy utility costs savings.<sup>24</sup>

Most traditional (high-flow) valves spray water at rates of 2.5 - 4.5 gpm and may be used up to several hours daily in a restaurant. The older models that consume 4.5 gpm translate to an annual operating cost of about \$1,900 if used for just one hour a day.<sup>25</sup> That's expensive dish washing!

<sup>24</sup> Savings based on an operating schedule of 1 hour of usage per day for 363 days, an assumed natural gas utility cost of \$1/therm, combined water/sewer cost of \$8.5/CCF, and 70% water heater efficiency with 70° F temperature rise in water temperature through the heater.

<sup>25</sup> Savings based on an operating schedule of 1 hour of usage per day for 363 days, an assumed natural gas utility cost of \$1/therm, combined water/sewer cost of \$8.5/CCF, and 70% water heater efficiency with 70° F temperature rise in water temperature through the heater.

## DID SOMEONE SAY “SAVINGS”?

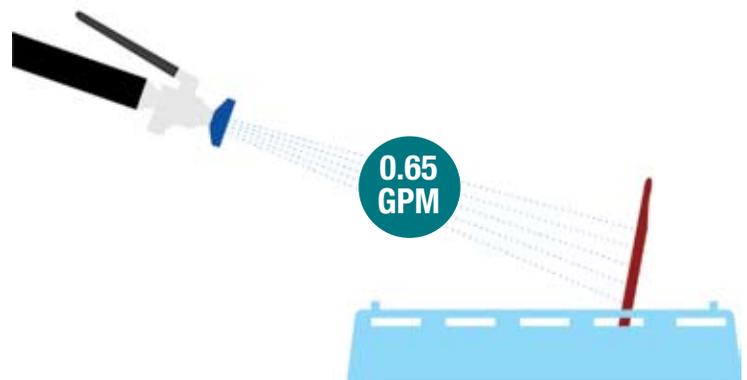
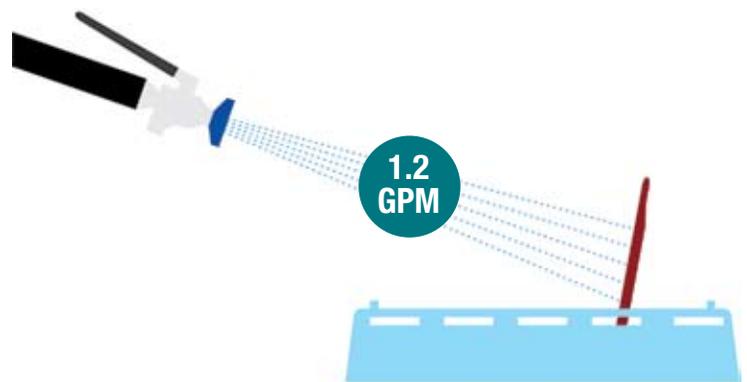
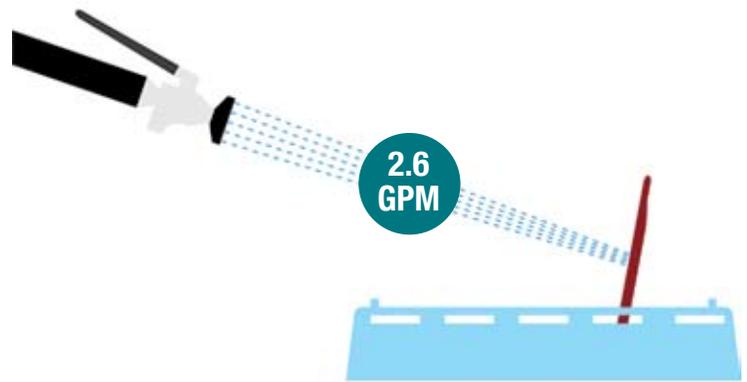
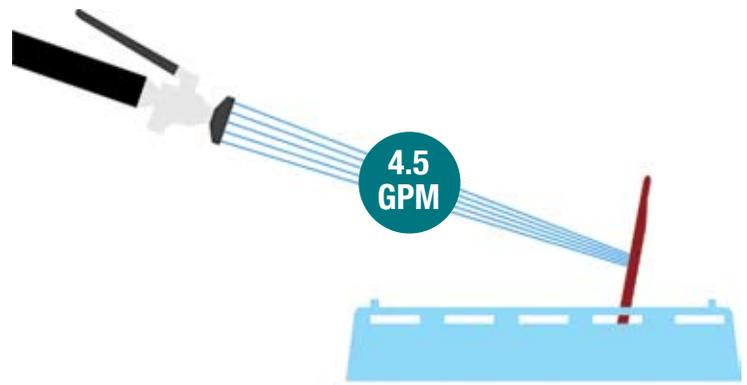
Since you usually use hot water with these pre rinse spray valves you could save as much on your energy bill as you will on your water bill depending on your water and energy utility rates . One way to calculate your energy and water savings is to use the FSTC Pre Rinse Spray Valve Calculator:

<http://www.fishnick.com/savewater/tools/watercalculator/>

- Make sure to check with your utility company about this when you’re looking to buy a low flow nozzle. Many utility companies offer rebates or free installation of these devices.

### NOTE:

There is a federal regulation mandating that all commercial pre rinse spray valves manufactured on or after January 1, 2006 must have a flow rate of no more than 1.6 gallons per minute.



## FIELD STUDY

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### DISH WASHERS

#### WHAT YOU CAN DO

##### **Install an ENERGY STAR® qualified dish machine.**

Modern ENERGY STAR® dish machines typically use half the water of their inefficient predecessors, delivering significant operating cost savings. If you lease a dish machine request an ENERGY STAR® qualified machine.

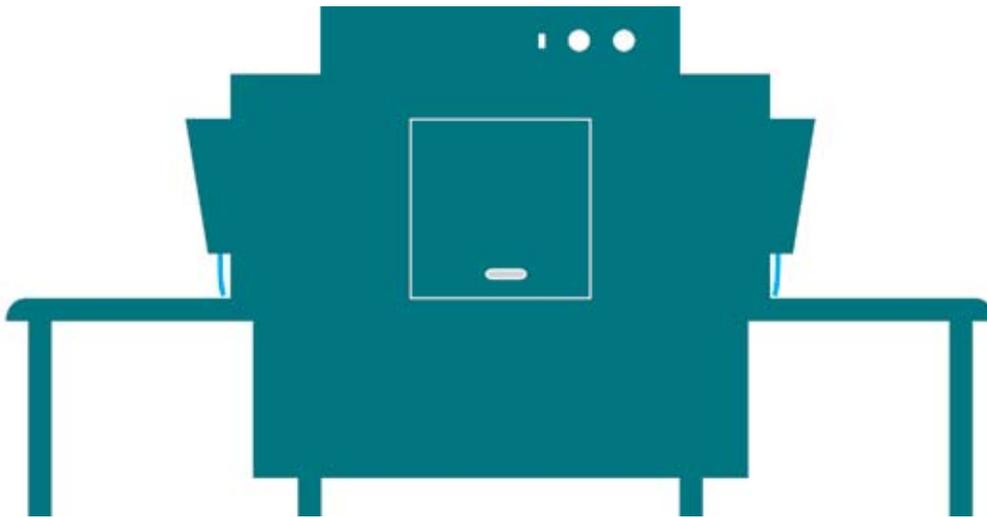
A door type dish machine that washes 300 racks per day and is rated at 1.5 gal/rinse cycle would typically consume 164,250 gallons of water annually. Alternatively, an ENERGY STAR® qualified machine consuming 0.75 gal/rinse cycle would consume only 82,125 gallons annually a water savings of 930.<sup>26</sup>

#### DID YOU KNOW?

Dish machines have a wide range of water consumption, but a restaurant with an older rack conveyor machine could expect to consume anywhere between 1,000 and 2,500 gallons daily. In light of their high water usage, proper selection, operation, and maintenance of these appliances is crucial to minimizing water use in your restaurant. An ENERGY STAR® unit would cut the water consumption in half.<sup>27</sup>

#### REMEMBER:

Don't reset the timers or increase the rinse pressure from factory settings. Water use can be drastically changed, significantly increasing water and energy use.



<sup>26</sup> Calculations based on a combined water/sewer cost of \$8.5/CCF

<sup>27</sup> <http://www.bewaterwise.com/pdf/ICP/2013ICP-FisherNickel.pdf>

# Energy Efficiency Requirements for Commercial ENERGY STAR® Dishwashers

## HOW TO CHOOSE A GOOD MACHINE?

So what makes a dish machine ENERGY STAR® qualified? ENERGY STAR® released its latest v2.0 specifications on February 1, 2013. The requirements are summarized in the chart below.

MACHINE TYPE	HIGH TEMP EFFICIENCY REQUIREMENTS		LOW TEMP EFFICIENCY REQUIREMENTS	
	Idle Energy Rate*	Water Consumption	Idle Energy Rate*	Water Consumption
Under Counter	≤ 0.50 kW	≤ 0.86 Gal/rack	≤ 0.50 kW	≤ 1.19 Gal/rack
Stationary Single Tank Door	≤ 0.70 kW	≤ 0.89 Gal/rack	≤ 0.60 kW	≤ 1.18 Gal/rack
Pot, Pan & Utensil	< 1.20 kW	≤ 0.58 Gal/rack	≤ 1.00 kW	≤ 0.58 Gal/rack
Single Tank Conveyor	< 1.50 kW	≤ 0.70 Gal/rack	≤ 1.50 kW	≤ 0.79 Gal/rack
Multiple Tank Conveyor	< 2.25 kW	≤ 0.54 Gal/rack	≤ 2.00 kW	≤ 0.54 Gal/rack
Single Tank Flight Type	Reported	GPH ≤ 2.975x + 55	Reported	GPH ≤ 2.975x + 55
Multiple Tank Flight Type	Reported	GPH ≤ 4.96x + 17	Reported	GPH ≤ 4.96x + 17

\* Idle results should be measured with the door closed and represent the total idle energy consumed by the machine including all tank heater(s) and controls. Booster heater (internal or external) energy consumption should not be part of this measurement unless it cannot be separately monitored per the ENERGY STAR® Test Method.

## LOW-TEMP VS. HIGH-TEMP MACHINE

Chemical sanitizing machines are known as “low temp” machines and those using hot water for sanitizing are known as “high temp” machines. There are several categories of dish washing machines, the most common for restaurants being door types and rack conveyors. If you have the ability to do so, get a high temp dish machine. High temp machines consume less water to get the job done than their low temp equivalents.

Additionally, with high temp machines, glassware has been known to come out with less chemical residue because no chemical is used in the final sanitation cycle (as it is with low temp machines). For beverage enthusiasts, this is a highly desirable performance trait of a dish machine, because it means the drinking experience of their client will not be compromised.

Make sure to use the ENERGY STAR® Qualified List to identify and compare high-efficiency dish machine options. This list is available as an Excel spreadsheet or use the online interface at: [http://downloads.energystar.gov/bi/qplist/commercial\\_dishwashers\\_product\\_list.xls](http://downloads.energystar.gov/bi/qplist/commercial_dishwashers_product_list.xls)

Also see: [https://www.energystar.gov/products/commercial\\_food\\_service\\_equipment/commercial\\_dishwashers](https://www.energystar.gov/products/commercial_food_service_equipment/commercial_dishwashers)

ENERGY STAR® makes it even easier for you to find a qualified dish machine by providing a handy listing of partnering dealers and distributors in their “Where to Buy” guide: [http://energystar.gov/index.cfm?=commercial\\_food\\_service.dealers\\_distributors](http://energystar.gov/index.cfm?=commercial_food_service.dealers_distributors)

## EFFICIENT DISH MACHINE MAINTENANCE AND OPERATION

### **Inform Employees:**

Staff should be reminded to minimize use of the dish machine by fully loading dish racks and getting food particles off dishes before running a rack through the machine. No need to waste water and energy!

### **Check the Machine’s Calibration:**

Proper calibration also minimizes water consumption. The rinse cycle time should be set to the manufacturer’s minimum recommended

setting and periodically verified. The rinse pressure should be maintained at the manufacturer’s specification, typically 20 psi.

### **Avoid Messing with the Rinse Cycle:**

Some dish machines allow operators to activate the rinse cycle manually, which can result in the rinse cycle remaining “on” longer than needed. If left unattended, the machine will consume water at its specified flow rate uncontrolled. For example, as much as eight gallons per minute might be consumed by the machine if left in a continuous rinse cycle setting! In short: make sure the rinse cycle is set to manufacturer’s specifications and don’t mess with it.

### **Inspect, Inspect, Inspect:**

Set up a regular maintenance program for the dish machine to avoid losing dollars down the drain! You might have a service contract for this maintenance, or you can do it yourself.

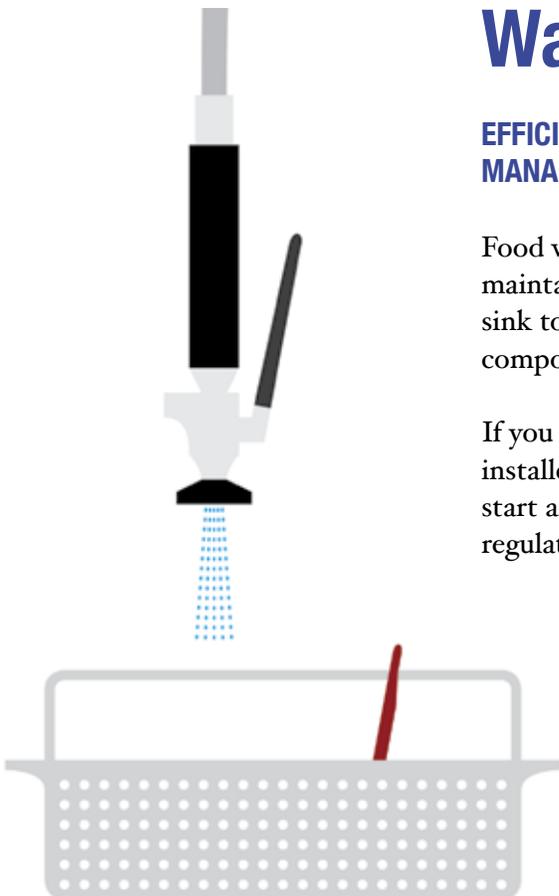
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# Waste Management

## EFFICIENT FOOD WASTE DISPOSERS AND OTHER MANAGEMENT TECHNIQUES

Food waste disposers consume water and energy and are expensive to maintain. It is recommended to use a strainer basket in the pre rinse sink to catch food product and dispose of it in the compost bin or trash.

If you do choose to use a disposer, controls can be installed that sense food waste and automatically start and stop the flow of water as well as regulating the flow of water being supplied.



# Ice Machines

## How do you know whether to replace your current ice machine with a more efficient one, or just stick with the one you've got?

- FishNick recommends replacing water-cooled machines as soon as possible to achieve the most savings possible.
- Check the make and model against Air Conditioning, Heating, and Refrigeration Institute database to see how it compares to other models.<sup>30</sup>
- You can also compare your current model against high-efficiency options by using the FSTC Ice Machine Cost Calculator.<sup>31</sup>



## WHAT YOU CAN DO

Install an ENERGY STAR® qualified Ice Machine (Air-Cooled Only)

Consult the helpful info on FSTC and ENERGY STAR® websites for advice on choosing an efficient ice machine. For example, you can look up performance data and water consumption data for high-efficiency ice machines using the ENERGY STAR® Qualified Ice Machine List.

## DID YOU KNOW?

Your choice of ice machine can have a big impact on your restaurant's water usage. Although water-cooled ice machines are as energy efficient as air cooled machines, their water use makes them far more expensive to operate.

A typical water cooled ice machine found in a restaurant setting can use an extra 150 gallons/100 lbs of ice just to cool the machine vs. an air cooled machine which uses 0 gallons to cool the machine .<sup>28</sup>

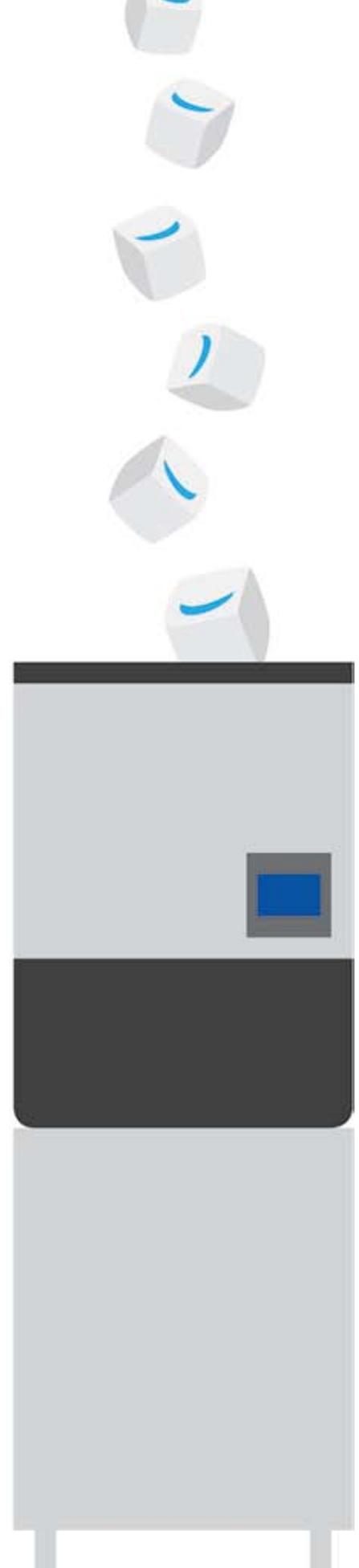
In terms of operating cost, an air cooled 600 lb/day machine can annually save around 326,700 gallons of water and 3,700 in water costs over an equivalent water cooled ice machine.<sup>29</sup>

28 <https://www.ahridirectory.org/ahridirectory/pages/acim/defaultSearch.aspx>

29 <http://www.fishnick.com/saveenergy/tools/calculators/icemachinecalc.php>

30 <https://www.ahridirectory.org/ahridirectory/pages/acim/defaultSearch.aspx>

31 <http://www.fishnick.com/saveenergy/tools/calculators/icemachinecalc.php>



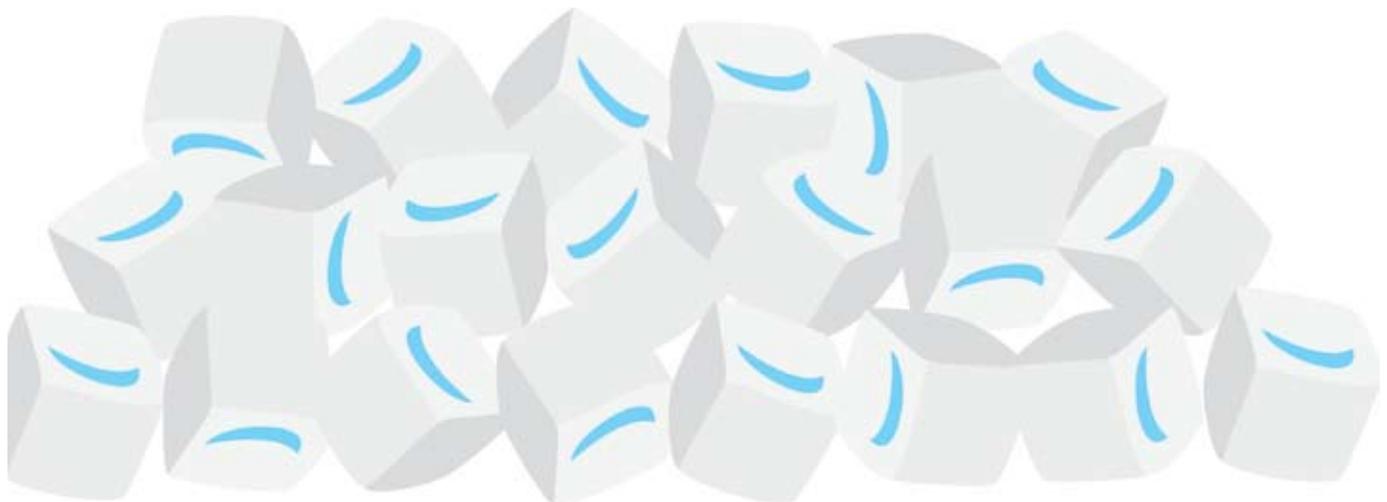
## Different Ice Machines: Example Comparing the Total Cost to Operate for Three Different Types of Medium Ice Machines (600 lb/day ice harvest rate)\*

MACHINE TYPE	STANDARD WATER-COOLED ICE MACHINE	STANDARD AIR-COOLED ICE MACHINE	ENERGY STAR® QUALIFIED ICE MACHINE
Ice Harvest Rate (lbs of ice/24 hrs)	625	600	664
Potable Water Use Rate (gallons/100 lbs of ice)	26	28	19
Condenser Water Use Rate (gallons/100 lbs)	150	none	none
Energy Use Rate (kWh/100 lbs of ice)	7.3**	6.9	5.1
Annual Water Use	287,496 gal	45,736 gal	31,037
Annual Energy Use	11,925 kWh	11,271 kWh	8,331 kWh
Annual Water Cost	\$3,267	\$520	\$353
Annual Energy Cost	\$1,312	\$1,240	\$916
<b>Total Utility Cost</b>	<b>\$4,579</b>	<b>\$1,760</b>	<b>\$1,269</b>

\* all savings assume 450lbs of ice made per day for 363 days/year, electric utility costs of \$0.11/kWh and combined water/sewer costs of \$8.5/CCF.

\*\* energy use rate is slightly higher in this example as it depicts a slightly older model (which reflects many real-world observations of existing water-cooled units in restaurants)

The table above shows that replacing an existing water cooled ice machine with an ENERGY STAR® qualified machine saves 3,300 a year. This savings means the machine would pay for itself in under two years.



# Steam Cookers



## WHAT YOU CAN DO

### **Install an ENERGY STAR® qualified connectionless steam cooker!**

Some boiler-based steamers are beginning to get certified for ENERGY STAR® too as control designs continually improve, so look out for them if your commercial kitchen requires it.

For a full list of ENERGY STAR® qualifying steam cookers, visit:

<https://www.energystar.gov/productfinder/product/certified-commercial-steam-cookers/results>

## DID YOU KNOW?

Choose your steamer wisely. Connectionless steamers use substantially less energy and water than boiler based steamers.

Boiler based steamers feature a boiler that produces and injects steam into the cooking cavity. Since steam is continually produced during operation, these steamers use A LOT of water. Most boiler based steamers drive up operating costs by consuming an average of 40 gallons of water per hour.

Boiler based machines are preferred for steaming batches of food to order, or “a la carte”, since they generally have higher production rates and quicker recovery times. If you require a boiler based steamer for your restaurant, look for one that uses less than 15 gallons per hour.

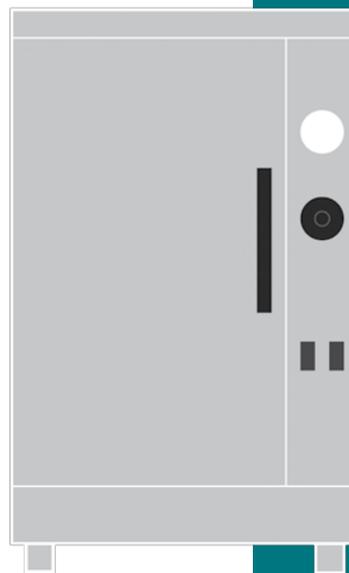
Connectionless steamers do not require a dedicated water line as they are manually filled with water. Steam is produced inside the cooking cavity, condenses, and then returns to the reservoir to revert into steam again throughout operation.

An ENERGY STAR® connectionless steamer can save you up to 100,000 gallons of water per year compared with its boiler based equivalent. Accounting for energy costs, that equates to an annual savings of 4,500.<sup>32</sup>

<sup>32</sup> FSTC Steamer Life-Cycle Cost Calculator 6-pan efficient steamer vs. base model, \$0.11/kWh, \$8.5/CCF

## BEST PRACTICES FOR STEAM COOKER OPERATION

- **Cut unnecessary preheat time.** Most steamers preheat in 15 minutes or less, so don't switch the machine on until shortly before cooking.
- **Compartmentalize.** Use only as many steam compartments as you need.
- **Cut down on idle time.** Eliminating an hour of idle time per day on a boiler-based steamer can yield annual savings of \$200 to \$700.
- **Maintain door gaskets & hinges.** Inspect steam cooker door gaskets and hinge alignment often. Heat escaping steam compartments can increase energy and water consumption as well as affect cook times.
- **Use automatic controls.** Most all steamers have a “cook mode”, which maintains the standard operating temperature for the compartment, and an “idle mode”, which holds the compartment at a lower temperature when not in use. Make sure the steamer is set to go into idle mode when not cooking as this can save a significant amount of water.



## BEST PRACTICES FOR COMBINATION OVEN OPERATION

- **Use smart controls.** Utilize the oven's programming capabilities to properly control different cooking modes (steam, convection, & combination) and limit water consumption through implementing shut off/set back times, adjusting humidity percentage, etc.
- **Limit mode use.** "Combi mode" employs both convective and steam heat to cook food product and is the most water intensive mode in a combination oven. As such, use combi mode sparingly and only when necessary.
- **Cut idle time.** Turn the oven down or off during slow times. Most combi ovens have automated options that can be engaged through programming. Cutting out two hours of idle time per day can save \$400 to \$800 annually.
- **Cook full loads.** Cook full loads of food in the combination oven whenever possible as the oven is more water efficient when full. This also extends to specification: choose an appropriately sized combination oven for your production needs.
- **Institute a maintenance schedule.** Make sure to inspect door gaskets and hinge alignment to prevent any leaks. Set up a cleaning schedule for the oven. If boiler-based, de-lime the oven when needed.

# Combination Ovens

## ✓ WHAT YOU CAN DO

### Install an ENERGY STAR® qualified combination oven!

Consult the FSTC and ENERGY STAR® websites for more combination oven information, specifications, and a full list of qualified models.

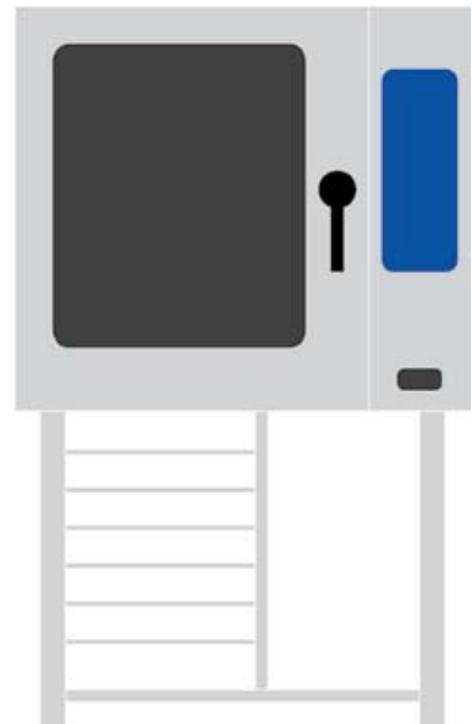
### DID YOU KNOW?

Combination steamer convection ovens can be the most water intensive appliance in your cooking line using upwards of 50,000 gallons of water per year.<sup>33</sup> With their ability to poach, roast, steam, and sometimes even smoke, combi ovens are gaining popularity in restaurants for their versatility and efficiency, but their heavy water use should be a consideration.

Much like steamers, combination ovens are offered in boiler-based and boilerless options. On average, boiler based convection and steam heat combination ovens use upwards of 20 gallons per hour at maximum while their boilerless counterparts typically use just below 10 gallons per hour.<sup>34</sup>

Though not as stark a difference as in steam cookers, a boilerless combination oven will still deliver the same product quality while using less water, so specify a boilerless model when possible.

Specifying an ENERGY STAR® certified combi oven over a baseline model can save you about 600 in yearly water costs not to mention thousands in energy costs as well.<sup>35</sup>



<sup>33</sup> <http://fishnick.com/savewater/bestpractices/>

<sup>34</sup> <http://fishnick.com/saveenergy/tools/calculators/gcombialc.php>

<sup>35</sup> <http://fishnick.com/saveenergy/tools/calculators/gcombialc.php>

# Water Heaters

Water heaters are often improperly installed and poorly maintained in restaurants. Storage tank water heaters are often stuck in a cramped far corner of the kitchen or basement and can be forgotten when implementing efficiency measures.

## TANKLESS “ON-DEMAND” WATER HEATERS

Some restaurants may use on demand water heaters for dish machines in the kitchen, and/or small electric units at hand sinks in restrooms or dining rooms that are distant from the central water heater. While this does not lead to significant energy savings in a commercial restaurant setting, the FSTC has observed through monitoring projects that installing tankless heaters at remote hand sinks may result in some appreciable water savings. This is because the hot water is delivered much faster, so the common practice of letting the water run until it is acceptably hot may be diminished, though actual savings are hard to project.



### WHAT YOU CAN DO

Use a commercial plumbing professional to install or replace commercial water heaters and accessories. Don't try to do it yourself, or think you can get by purchasing a residential water heater. FYI: Residential water heaters and fittings will fail quickly as they are designed for very light duty applications .

- Water heaters should have an expansion tank and back flow preventer installed to prolong the life of the heater and to prevent leaks.
- Check Temperature Pressure Relief valves: These are the safety mechanisms that keep modern water heaters from exploding when they become over heated. But they can fail over time, which allows hot water to leak unnoticed. A light stream of leaking water at about 0.1 gpm, which is about six gallons an hour, will add up to 50,000 gallons, by year end, costing you almost 600 in water alone. <sup>37</sup>

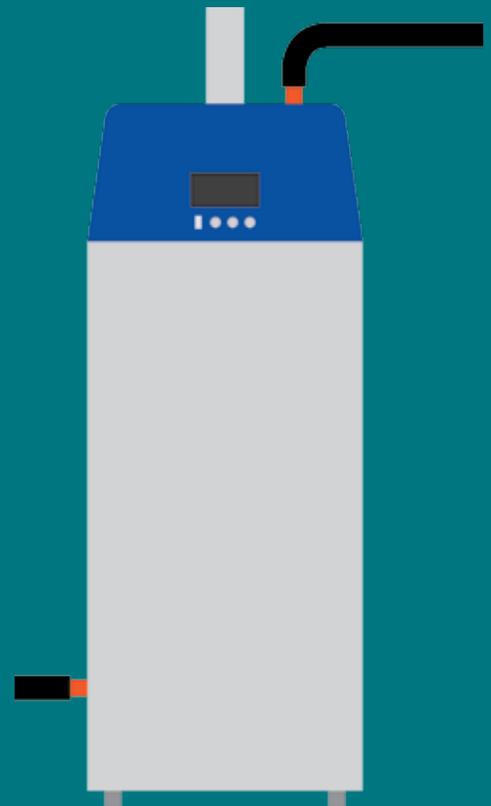
Installing one inch foam insulation on all hot water pipes greatly reduces heat loss from the pipes. Reducing the heat loss helps the hot water already in the pipes to stay hot, which means faster hot water delivery and less cold water wasted at the tap.

<sup>36</sup> The hot water tank is lined with glass to prevent corrosion of the main steel body. The glass lining often has small imperfections, that over time, may allow water to penetrate and lead to corrosion of the storage tank.

<sup>37</sup> <http://www.fishnick.com/savewater/tools/leakcalculator/>

## DID YOU KNOW?

The Water Storage Tank will rust out eventually when it has reached its life expectancy and its ultimate failure may result in a slow leak or burst, a significant waste of water and loss of hot water to your restaurant.<sup>36</sup> Also, unexpected failure of the tank and the flooding of water may require you to shut down your restaurant and lose revenue.



# Toilets and Urinals

## HOW TO CHOOSE THE RIGHT TOILET?

### DID YOU KNOW?

Americans use more water each day by flushing the toilet than they do by showering or any other activity.<sup>40</sup> Depending on your restaurant's size and the volume of customers, toilets could be one of the main sources of water use in your business!

The older less efficient models of toilets can use up to 4.5 gpf, which cost about 5 cents per flush. Current federal standards allow a maximum of 1.6 gpf but there are also toilets available that only use 1.28 gpf, which cost about 1.5 cents per flush. Considering that toilets in restaurants can be flushed a hundred times a day, that 3.5 cents in savings can add up to over \$1,250 a year.<sup>41</sup>

**Look for models certified by EPA's WaterSense® program,**<sup>38</sup> which are available at hardware and big box stores, plumbing supply stores, or online. They list toilets with 1.28 gallons per flush (gpf) and dual-flush tank toilets.

### Pressure Assist/Power Assist Toilets

- These come in rates as low as one gallon per flush, and while they are 'low-flow' they have a forceful flush that can handle the high use of a commercial restroom.
- You can use the "MaP Ratings" resource for finding the highest performing toilets.<sup>39</sup>
- Note: Thanks to the "pressure assist" feature, these guys are a bit noisy. If your restroom is right next to a study corner, you might want to think carefully about this option.

### Dual Flush Toilets

- These have buttons or levers that use half a flush for liquid waste – typically 0.8 gpf - and a full flush for solid waste - typically 1.6 gpf.
- Note: With these toilets, you are counting on your customers to choose the right button to push – so it's also a great educational opportunity. You can put up a clear sign explaining the dual flush or how your restaurant is committed to conserving water.

### Waterless or Low-Flow Urinals

- Current plumbing codes require a maximum flow rate of 1.0 gpf, but there are low-flow options that use 0.5 gpf or a 'pint per flush' (1/8 gallon), or even 'waterless'.
- Note: Waterless urinals use a gel instead of water to keep the urinal clean and smelling nice. They involve different maintenance and cleaning so it is important to understand these elements before purchasing.

38 EPA Water Sense Program: <http://www.epa.gov/WaterSense/pubs/supply.html>

39 <http://www.map-testing.com/about/maximum-performance/map-search.html>

40 EPA Water Facts: [http://water.epa.gov/learn/kids/drinkingwater/water\\_trivia\\_facts.cfm](http://water.epa.gov/learn/kids/drinkingwater/water_trivia_facts.cfm)

41 <http://www.epa.gov/WaterSense/products/toilets.html>



## WHAT YOU CAN DO

### Get a water-efficient toilet.

A new low-flow toilet typically costs between \$300 and \$500, but savings could range from 20-60%, depending on your old toilet and the efficiency of the new one.

Important: Many cities, counties, or utilities offer rebates and incentives for replacing old toilets with efficient models. Check first before you buy!

## FIELD STUDY

### CAFE SAVINGS

One cafe monitored by FSTC in the San Francisco Bay Area had already installed 1.5 gallons per flush toilets and each toilet in the store was flushed on average 95 times a day, using an average of 142 gallons of water a day. This cafe went one step further and installed a pressure-assist high efficiency toilet (HET) at 1.0 gpf – it was projected to save 33%, or 47 gallons per day at each restroom. Overall, it was found that total store water use would be reduced by 7% with a savings of almost 200 annually with the installation of one ultra high-efficiency toilet in this cafe's restroom.

### OPENING A NEW RESTAURANT?

If so, installing a water-efficient toilet is a no-brainer (and required by law). Consider the options above and install the best low-flow option for your restaurant.

#### For Existing Restaurants: Replace old toilets.

Modifying an existing commercial toilet with a water saving device (such as adjusting flapper valves, etc.) is generally not recommended. Commercial toilets get a lot of use and trying to change the flow rates of your existing toilet could change the flushing dynamics and result in a poor flushing toilet.

#### Don't Forget to Check Your Toilet for Leaks:

See "Stop Leaks" on page 12 for instructions on using food coloring to test for leaks.



### TIP:

*Every drop counts.  
Don't forget to check  
your toilet for leaks.*



# Water Filtration Reverse Osmosis



## WHAT YOU CAN DO

## DID YOU KNOW?

Water quality varies significantly not only by municipality and water utility, but sometimes from building-to-building due to the delivery of the water through a long series of underground pipes of varying ages, conditions, and materials. So understanding your particular restaurant's water quality is paramount to choosing the right filtration process.

When considering a reverse osmosis system for your restaurant, you can get your local water quality information online and can combine that with doing a simple water quality test for your restaurant's particular water. All water utilities are required by law to provide their customers with free **Annual Water Quality Reports**.<sup>42</sup>

To conduct your own onsite water quality test, you can buy one from any water expert or purchase an at-home water quality test online for around \$30. The EPA provides some helpful information on this process.<sup>43</sup>



**Make sure Reverse Osmosis (RO) is the right system for your restaurant.** RO should be used only when the mineral content in your city/restaurant's water is so high that mineral scale would form in your equipment and would significantly affect their performance. In the appropriate context, RO systems ultimately save the restaurant operator money by reducing equipment maintenance, chemical use, and repair costs.

**Purchase an efficient RO system.** When shopping for an RO system, compare them according to efficiency (proportion of filtered water to 'rinse' water), not just price. Ideally, an efficient RO system should have a 1:1 efficiency, but some systems may be as low as 1:10.

**Make sure your RO system is set properly, so water is being used most efficiently.** Your RO system should be calibrated based on the restaurant's actual water quality and the manufacturer's suggested settings for that particular water quality. Some systems are set too high and therefore valuable water and money go down the drain literally!

**Reuse the rinse water if at all possible.** The great news about the rinse water from an RO membrane is that it does not all need to be wasted down the drain – it is generally classified as water reuse (rather than water cycling) and therefore it can be put to good use with less government regulation. Some options are:

- Run this water outside to irrigate planters and/or landscaping.
- Use special plumbing techniques to run this water to hand sinks, utility sinks, and possibly dipper wells depending on health code.
- City approval is required for these reuse techniques, but many cities are getting on board with reuse applications and approving permits for these.

<sup>42</sup> Samples of annual water quality reports can be found at the following EBMUD page:<http://www.ebmud.com/water-and-wastewater/water-quality>

<sup>43</sup> [http://www.epa.gov/ogwdw/faq/pdfs/fs\\_homewatertesting.pdf](http://www.epa.gov/ogwdw/faq/pdfs/fs_homewatertesting.pdf)



## FIELD STUDY

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### REVERSE OSMOSIS

FSTC monitored one cafe and found that the RO system was the greatest water use point in their commercial kitchen.

It processed 381 gallons of water daily, of which 165 were used downstream in making drink products, and 216 were purged as wastewater, translating to a RO efficiency of 43%.

This is a good example of how important it is to purchase and maintain an efficient RO system.





# What's Left?

## General Building and Maintenance

### OUTSIDE YOUR RESTAURANT

#### Landscaping

Installing moderate to low water using plants or drought tolerant landscaping can lead to big savings on irrigation water use.

Can you avoid vegetative landscaping? Hardscape and other decorative options can be an attractive, durable, zero water solution worth considering.

#### Outdoor Misters

Restaurants in dry climates sometimes use misting systems to cool their outdoor dining areas. Remember to only turn these systems on when they are needed and to regularly check the water lines and nozzles for leaks.



### WHAT YOU CAN DO

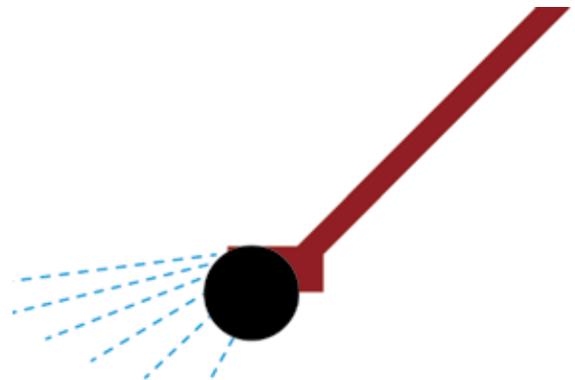
**Sweep sidewalks** and parking lots clean rather than hose them off with water.

#### Use Water Brooms Instead of Nozzles

- If your task requires a hose just know that the garden hose nozzles or industrial wash down sprayers used for surface wash down can be total water guzzlers and have flow rates as high as 7.0 gpm. However...
- An excellent alternative is the water broom, especially for large areas like garbage bin storage areas. With a maximum flow rate of 2.0 gpm, the water broom not only saves water, but its wide spray arm with multiple water jets cleans far more efficiently than a single stream spray nozzle or industrial sprayer.
- Some utilities offer rebates for water brooms – so check before you buy one.

#### TIP:

*Water Brooms can offer substantial savings for your exterior building water needs.*



## DID YOU KNOW?

In 15 minutes, running water through a hose can add up to more than 100 gallons of water. If this is done daily for 363 days per year, that adds up to 36,000 gal/yr or about 100 CCF. That's 400 annually!<sup>44</sup>

Using a water broom consumes about 70 less water than a standard hose, potentially saving 300 worth of water annually!<sup>45</sup>

## SPRINKLER OR IRRIGATION



### WHAT YOU CAN DO

**Install self-adjusting controllers on irrigation or sprinkler systems** that water according to climate conditions and plant materials, so you can ensure proper watering with minimal water waste.

#### Other tips include:

- Install high efficiency spray nozzles.
- Install drip irrigation for improved water delivery.
- Install a pressure regulator to reduce misting.
- Apply mulch to reduce evaporation.
- Set timers to go on before dawn or after dusk to avoid waste via evaporation.
- Install a rain water shut off device.
- Check to ensure that sprinklers are not watering concrete, fences and foundations, preventing unwanted water damage.
- Inspect & maintain irrigation systems: broken sprinkler heads and leaking water lines are common failure points
- You can purchase smart irrigation controls at your local hardware store or big box retailer. [https://www3.epa.gov/watersense/product\\_search.html?Category=5](https://www3.epa.gov/watersense/product_search.html?Category=5)
- Some utilities and municipalities provide rebates for these water conservation devices, so check with your local agency.
- Plant native shrubs and flowers that require minimal water and care.
- Also remember that if you have an RO system, there could be potential to use RO rinse water to irrigate plants and/or landscaping.



44 Calculation based on \$8.5/CCF

45 Calculation based on \$8.5/CCF

## EVAPORATIVE COOLING UNITS: “SWAMP COOLERS”

Do you use an evaporative cooling unit or “swamp cooler” to keep your restaurant cool and comfortable? While evaporative cooling can be an inexpensive way to introduce cool air into the kitchen, most water professionals do not recommend this approach because poorly maintained evaporative coolers are major water wasters. And, because most evaporative coolers are located on the roof out of sight out of mind poorly maintained evaporative coolers are very common.

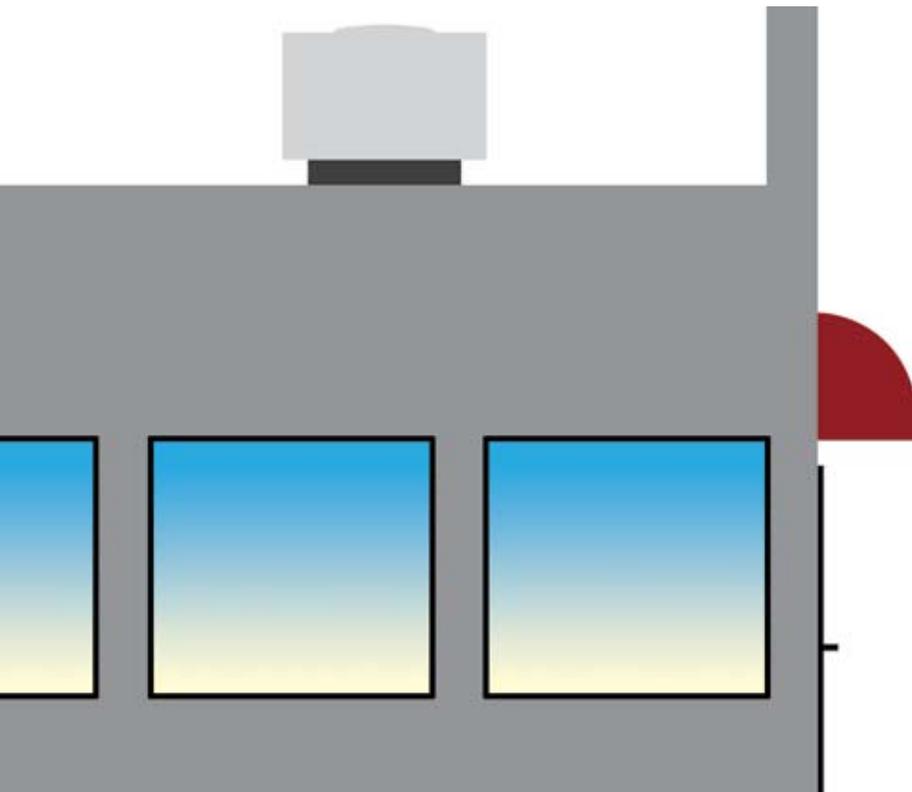
If you do have an evaporative cooler, then it’s very important that you regularly inspect and properly maintain your unit or else you run the risk of sending a lot of your money down the drain.

If you do not currently have an evaporative cooler and are considering installing one, be sure to include the maintenance and water-use costs in your calculations. You may find that installing a traditional packaged air handler could be more effective at cooling and less expensive overall.

### WHAT YOU CAN DO

#### **Don’t turn your roof into a swamp!**

- Inspect your evaporative cooling unit quarterly to save water and money and use a preventive maintenance contractor to keep the unit operating properly. Evaporative coolers are relatively simple devices, but they require a lot of upkeep and become quickly non functional when they are not well maintained.



- Check to make sure float valves are not stuck open.
- Adjust fill level and check over flow drains.
- Check condition of media and replace if necessary.
- Turn the water off in the winter if you do not use the unit.

# Action Plan for Restaurants

Use the Following Checklist as a DIY Action Plan for Your Restaurant's Road to Water Conservation.



## GENERAL

- Start tracking your current water and energy use by monitoring utility bills and identifying anomalies. \$
- Institute an equipment maintenance schedule: monthly or quarterly. \$
- Repair all water leaks – especially hot water. \$\$
- Install low-flow aerators on kitchen and restroom hand sink faucets. \$\$
- Reduce water flow in dipper wells if possible. \$
- Use a refrigerator to thaw frozen products instead of running water. \$

## DISH ROOM

- Install an ENERGY STAR® qualified dish machine. \$\$\$
- Install a WaterSense® labeled low-flow pre-rinse spray valve with a flow rate of ≤ 1.28 gpm at the dish machine and pot-washing sink. \$
- Fully load dish machine racks. \$
- Turn off conveyors and water troughs when possible. \$
- Reset dish machine rinse timer and rinse pressure to the factory settings. \$
- Set up a regular maintenance schedule for the dish machine. \$

## KITCHEN/BACK OF HOUSE

- Install an ENERGY STAR® qualified ice machine (air-cooled only). \$\$\$
- Install an ENERGY STAR® qualified connectionless steam cooker. \$\$\$
- Install an ENERGY STAR® qualified combination oven. \$\$\$
- Cut down on unnecessary preheat and idle times for steam cookers and combi ovens. \$
- Inspect and maintain door gaskets, and hinges on steam cookers and combi ovens. \$
- Limit “cook mode” and “combi mode” use for steam cookers and combi ovens, respectively. \$

## RESTROOMS

- Install a water-efficient WaterSense® labeled toilet and consider power assist or dual flush units. \$\$
- Install a WaterSense® labeled low-flow urinal or a water-less urinal. \$\$
- Repair toilet leaks. \$\$

## OUTSIDE

- Sweep sidewalks and parking lots clean instead of using a hose. \$
- Use a water broom instead of a hose and spray nozzle. \$\$
- Install a WaterSense® labeled irrigation controller. \$\$
- Plant low-water using or drought tolerant landscape. \$\$
- Regularly inspect and maintain your evaporative cooling unit. \$

## WATER HEATER(S)

- Avoid tank failure from corrosion by regularly flushing the hot water tank and maintaining the anode rod. \$
- Install one-inch foam insulation on hot water pipes. \$\$
- Inspect and replace a leaking water heater TPR pressure-relief valve. \$
- Install commercial grade “on-demand” water heaters at kitchen and restroom hand sinks. \$\$

## SAVINGS KEY

\$ No Cost with less than a year Return On Investment (ROI).

\$\$ Moderate investment with less than a 2-year ROI.

\$\$\$ More significant investment with a greater than a 2 year ROI.





# Case Studies

## Success Stories from the Real World

<b>Jamba Juice Dipper Wells</b>	<b>38</b>
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## CASE STUDY

# Dipper Wells

**Jamba Juice**, an international smoothie chain with over 700 stores worldwide, utilizes an industry standard appliance called a Dipper Well.

Dipper wells are designed to remove food and bacteria from frequently used preparation utensils like spoons and ice cream scoopers, flowing water into a small sink where soiled water is replaced with clean water on a continuous basis.



**Standard Dipper Well**

An iScoopShower only consumes water when there is a demand, cleaning utensils with jets of water which only flow when the operator depresses a plunger with a utensil.

**Press Down  
on  
Plunger  
to  
Activate Water**



On appearance, dipper wells look as though they consume very little water. However, onsite monitoring showed an average consumption of 166 gal per day per dipper well. To put that into perspective that is equivalent to taking a shower for over an hour every day.

With three dipper wells consuming almost 500 gallons per day and accounting for almost 2/3 of their water use, Jamba Juice replaced one dipper well with an iScoopShower, which cleans utensils with jets of water when a utensil activates a pressure switch. With its on demand design, the iScoopShower consumed significantly less water at 9.6 gallons per day, which is equivalent to taking a four minute shower.

The iScoopShower demonstrated a projected annual water savings of 910\* over the traditional dipper well it replaced.

Including installation, the iScoopShower, as used in the restaurant, would have a simple payback of less than a year.

\* Water costs are based on a combined water/sewer charge of \$12/CCF (1 CCF = 748 gallons), which reflects the actual cost at the restaurant in this case study.

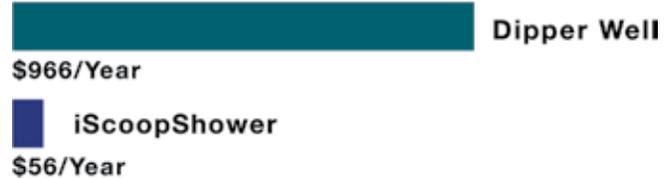


iScoopShower

## Water Consumption



## Annual Cost of Operation\*



## Would you take a 66 minute shower? \*\*



The iScoopShower used 6 of the water consumed by the dipper well during a day of operation.

That is an equivalent of a 4 minute shower for the iScoopShower versus a 66 minute shower for the dipper well.

\*\* Assuming an industry standard 2.5 gal/min showerhead.



## CASE STUDY

# ENERGY STAR® Dishwasher

**Bridges**, a fine dining restaurant in Danville, CA, has been setting the industry standard for energy and water-efficiency practices in recent years. After working on their appliance line, Bridges turned to their dish room for more efficiency gains. Their preexisting low temperature door type dish machine performed the majority of the cleaning and sanitization for the restaurant, seeing an average of 166 dish racks per day with a water consumption rate of 2.0 gal/rack.

That unit was replaced with an ENERGY STAR® qualified Hobart AM15VLT high temperature heat recovery dish machine that consumed 0.77 gal/rack and did not require a dedicated exhaust hood. The 1.23 gallon/rack reduction in water saved Bridges 74,000 gallons of water per year.



**ENERGY STAR® Door-type high-temperature dishwasher**

## BENEFITS OF HEAT RECOVERY DISHWASHERS

An operator can replace their low-temp unit with a high temp unit and not need to install a costly ventilation system. Check with your local code official.



Bridges also previously used a 1.6 gal/rack low temperature under counter dish machine for cleaning and sanitizing glassware in the bar area where they typically run 26 racks per day. This unit was replaced with an ENERGY STAR® qualified Hobart LXR high-temperature heat-recovery dish machine consuming 0.6 gal/rack.

The 1 gallon/rack reduction in water consumption added up to 9,400 gallons in annual water savings.

Installation of the two water efficient dish machines saved Bridges 1,335 per year in water costs! Both of these dish machine projects replaced existing low temperature chemical dish machines with new high temperature units. The high temperature units included electric booster heaters which slightly increased the total cost to operate at this restaurant however; the chef/owner was so impressed with the increased performance of the high temperature units that he chose to stay with the new machines.



**ENERGY STAR® Under Counter high-temperature dishwasher**

## Under Counter Dish Machine Water Consumption



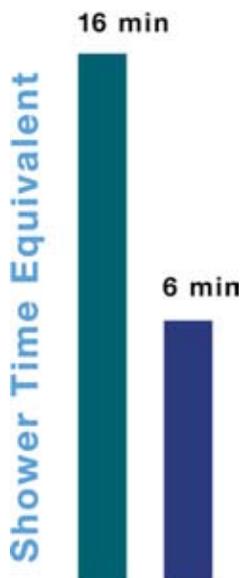
### Annual Water Costs\*



## Door-type Dish Machine Water Consumption



### Annual Water Costs\*



## Would you take a 16 minute shower? \*\*

The ENERGY STAR® under counter dishwasher reduced water consumption by 62 over the standard dishwasher. That is an equivalent of a 6 minute shower for the ENERGY STAR® dish machine versus 16 minutes for the standard.

\* Water costs are based on a combined water/sewer charge of \$12/CCF (1 CCF = 748 gallons), which reflects the actual cost at the restaurant in this case study.

\*\* Assuming an industry standard 2.5 gal/min showerhead.



*Switching to a water efficient ENERGY STAR® boiler-based steamer saved the Doubletree Hotel \$1,212 per year in water costs.*

## CASE STUDY

# ENERGY STAR® Steamer

**Doubletree Hotel by Hilton** features a full service kitchen supporting a casual dining restaurant, room service, business events, and weddings.

Their 10 year old two compartment conventional boiler based steamer was a source of significant water consumption within the kitchen.

For this type of steamer, a large proportion of water is used for condensate cooling. Excessively hot water/condensate coming out of the steamer cavity, per code, must be cooled to below 140°F before entering the sewer drain.

This drain water tempering with fresh water accounts for a majority of the steamer's water consumption. In an effort to reduce water consumption, Doubletree installed an ENERGY STAR® qualified Market Forge ETP 10G boiler based steamer featuring advanced condensate cooling and cooking pressure control technologies, saving water in two ways.

First, instead of a direct condensate cooling line, the condensate drain leads to a tempering tank that cools condensate released from the cooking compartment before it enters the sewer drain.

Second, the steam control system effectively regulates steam production, by injecting high temperature steam only when cooking, thus lowering the appliance's demand for water to replenish the steam generator.



**ENERGY STAR®  
Boiler-based Steamer**



Doubletree's existing two compartment boiler based steamer consumed an average of 242 gal/day while the Market Forge ENERGY STAR® boiler

based steamer with the condensate and cooking control package reduced water consumption to an average of 35 gals/day. Switching to a water efficient ENERGY STAR® boiler based steamer saved the Doubletree Hotel 1,212 per year in water costs.

The two compartment steamer in this case study is a relatively expensive piece of equipment and even at savings of over 1,000 a year, it doesn't make sense to replace an existing working unit with the more water efficient one. However, when that existing boiler-based steamer finally dies, it is definitely cost effective to specify the ENERGY STAR® boiler based unit as a replacement. The payback for the incremental cost will be under two years and could be as short as one year.



## Annual Water Consumption



## Annual Water Costs\*



## Would you take a 97 minute shower? \*\*



The ENERGY STAR® boiler based steamer used less than 15% of the water consumed by the conventional boiler based steamer during a day of operation.

That is an equivalent of a 14 minute shower for the ENERGY STAR® steamer versus a 97 minute shower for the conventional steamer.

\* Water costs are based on a combined water/sewer charge of \$12/CCF (1 CCF = 748 gallons), which reflects the actual cost at the restaurant in this case study.

\*\* Assuming an industry standard 2.5 gal/min showerhead.



## CASE STUDY

# Region of Waterloo: Restaurant Certification Program

Water efficiency certification programs build relationships with customers through education and support by giving them the tools to kick start water saving practices. The Region of Waterloo, Ontario, created a certification program to help restaurant owners identify opportunities for water savings. Certified restaurants know how much water they use, make changes to conserve, and educate their staff.



**Participating restaurants are required to accumulate at least 5 points by completing the following activities:**

- Contracted water balance audit 3 points
- Water use review with Water Services staff – 1 point
- Billing & Benchmarking analysis 1 point
- Proven water savings post implementation 3 points
- Employee education & awareness training 2 points
- Register for “Blue W” drinking water promotion program 1 point

## Employee Awareness Training

**Report leaks immediately.**

- A leak from a 1/32” hole in a pipe can waste up to 6,287 gallons of water per month!

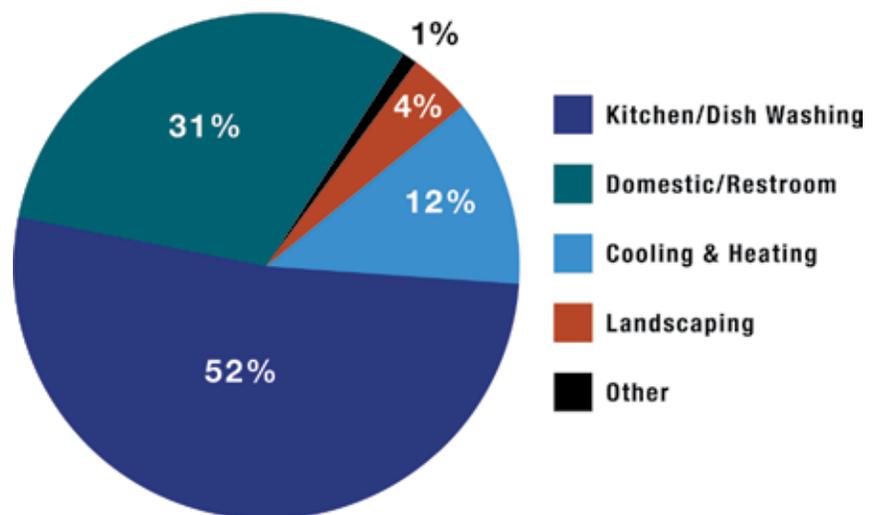
**Don’t leave the tap running unless necessary.**

- Each minute the tap is left running, 1.5 gallons of water is wasted.

**Sweep and mop rather than spray.**

- Dry clean up using brooms, vacuums or brushes can remove the bulk of solid materials and reduces the volume of water needed.

## Water Use in Restaurants



Through this program **Waterloo certified five local restaurants** as water efficient in 2015. These restaurants accumulated points for taking several initiatives that save water including auditing, improving technology, and educating staff; reducing water consumption by an estimated 10 percent per day. This is enough water to supply the daily needs of 11 average households in the Waterloo region.

## Key Changes Made

- Replacing pre rinse spray valves
- Replacing water cooled refrigerators with air cooled models
- Replacing inefficient ice making machines
- Upgrading water filtration equipment
- Fixing leaks
- Changed scheduling and educated staff to eliminate water thawing
- More Water savings at these locations are expected as water efficiency measures continue to be implemented



*Every Drop Counts.  
Even small savings  
each day are  
significant in the  
long term and will  
help extend the life of  
our water supply.*



# East Bay Municipal Utility District: Water Smart Certification Program

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In the world of “green business” certification programs, water efficiency has typically taken a backseat to the standard energy, recycling and waste reductions efforts. To help bring awareness to the importance of water conservation, many water utilities are now developing their own certification programs to bolster the green (or blue) industry.



The East Bay Municipal Utility District (EBMUD) has such a program called Water Smart Certification Program. These water first certification programs are not designed to compete with the green business programs, but to complement one another. Programs such as EBMUD's create brand recognition for the utility as well as recognition for their customer's conservation efforts.

## **Key benefits of a Water Smart Certification Program include:**

- Encourages and recognizes businesses, schools, institutions, etc., that exceed water efficiency standards.
- Advances water use efficiency products and best management practices.
- Fosters partnerships with vendors, nurseries, designers, and developers that promote the WaterSmart brand while also providing products and resources to consumers so that they can make informed efficiency decisions.
- Assists businesses in controlling operating costs through unbiased return on investment information to help them make sound business decisions.
- Supports local, state and national resource efficiency programs and efforts e.g., U.S. EPA's WaterSense® and ENERGY STAR® programs; local green business programs; etc.
- Continues to provide industry leadership in developing high profile programs and consumer awareness toward socially, economically and environmentally sustainable practices.

Upon certification, businesses are acknowledged with a three year award. Certified businesses have their water consumption tracked annually and are required to recertify every three years. To participate in the program applicants must: a) complete an EBMUD water use survey; b) implement water use efficiency measures to meet established benchmarks; c) submit an application for WaterSmart certification; d) conduct employee water efficiency training; and e) participate in a post implementation inspection and review.

# Resources and References

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## **Air-Conditioning, Heating, and Refrigeration Institute (AHRI)**

### **Ice Machine Database**

<http://www.ahridirectory.org/ahridirectory/pages/acim/defaultSearch.aspx>

## **Database of State Incentives for Renewable and Efficiency (DSIRE)**

<http://www.dsireusa.org>

## **ENERGY STAR® Commercial Food Service Equipment**

[https://www.energystar.gov/products/commercial\\_food\\_service\\_equipment](https://www.energystar.gov/products/commercial_food_service_equipment)

## **ENERGY STAR® Guide for Cafes, Restaurants and Institutional Kitchens**

[https://www.energystar.gov/products/commercial\\_food\\_service\\_equipment](https://www.energystar.gov/products/commercial_food_service_equipment)

## **EPA Commercial Water Sense Program**

<http://www.epa.gov/watersense/commercial/>

## **National Sanitation Foundation (NSF)/ANSI Listing for Commercial Warewashing Equipment**

<http://www.nsf.org/Certified/Food/>

## **Toilet Maximum Performance Testing Database**

<http://www.map-testing.com/>

## **Alliance for Water Efficiency**

<http://www.allianceforwaterefficiency.org>

## **PG&E Food Service Technology Center**

<http://www.fishnick.com>

## **East Bay Municipal Utility District**

<http://www.ebmud.com>

## **Metropolitan Water District of Southern California**

<http://www.bewaterwise.com>

## **Aiqueous**

<http://www.aiqueous.com>

## **Region of Waterloo**

<http://www.regionofwaterloo.ca>

## Use of this Guidebook

This project was jointly funded by the Metropolitan Water District of Southern California, Aiqueous, the Region of Waterloo, and the East Bay Municipal Utility District. In-kind contributions were made by the PG&E Foodservice Technology Center, and the Alliance for Water Efficiency.

The mention of trade names for commercial products does not represent or imply the approval or endorsement of the Alliance for Water Efficiency, or other partners on this project. This report is presented solely for informational purposes. Additionally, no responsibility is assumed by the Alliance for Water Efficiency or any of its partners for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use of operation of any methods, products, instructions or ideas contained in this guide.

Because technology changes quickly, independent product research should be performed before any changes are made in a commercial kitchen.

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