# EBMUD Commercial Guidebook:
# Food Service Operations

EBMUD

# FOOD SERVICE OPERATIONS

The food service operations sector includes technologies and equipment found in commercial kitchens, which are establishments that prepare food for public consumption or where food can be prepared for many people. Restaurants and bakeries are obvious members of this category, but commercial kitchens exist in a wide range of facilities. Most schools, hospitals, hotels, service stations with stores, and convenience stores have food service operations. Larger office buildings, factories, and institutional facilities provide food service of some type to their employees and occupants. Because food-service facilities are characterized by many kinds of water uses and high energy and water consumption, they are a good focus group for incentives or requirements for water-efficient equipment, both for new construction and retrofit of existing facilities.

Water is an essential component in a commercial kitchen; it is used for everything from food preparation to cooking, cleaning, refrigeration, and sanitation. Based on a 2019 study by The Water Research Foundation, eating and drinking places have the most intensive water use per square foot of any commercial and institutional facility (Table 9-1). This conclusion is based on data from six water utilities across the nation. Additionally, a 2015 California Energy Commission report shows that over 75 percent of hot water in the commercial and institutional sectors, from grocery stores to schools to prisons, is used by food service operations[1]. Thus, more efficient hot water use and energy efficient appliances will contribute to improved water efficiency and cost savings in this sector.

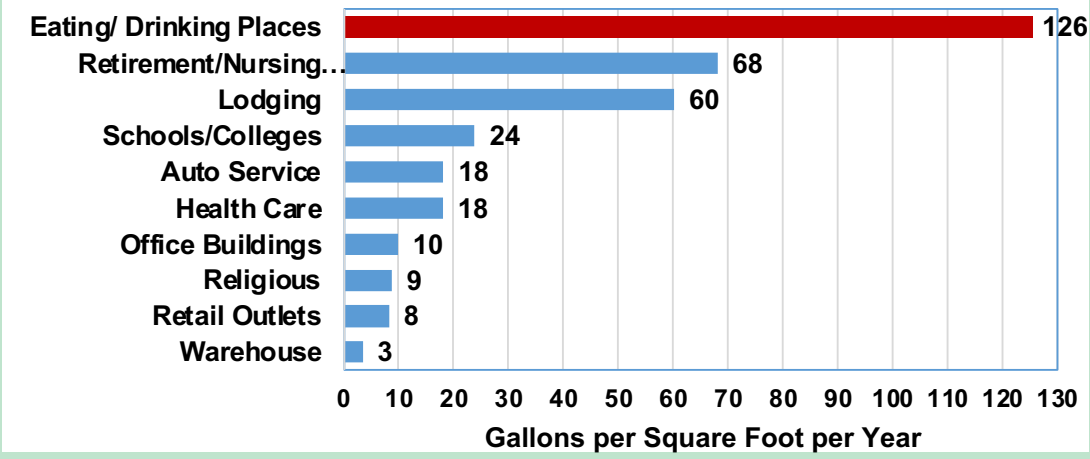
The US Environmental Protection Agency (EPA) WaterSense at Work Program estimates that 52 percent of a restaurant's water use is for kitchen use with the rest being for restrooms, landscape, and other uses (Table 9-2). The latter uses are covered in other chapters in this document. The focus of this section will be on the techniques and technologies applicable to operations in the kitchen and any other food service area.

See the References section at the end of this chapter for a list of resources.

This chapter will examine the operational areas of water efficiency in the food service sector, including:

1. Selection of food service equipment
2. The potential cost savings with each technology and method of operation
3. Best management practices for each technology and method of operation

**TABLE 9-1: Comparison of Water Use per Square Foot per Year for Various Commercial Establishments Across the USA**




1 Energy Efficiency Potential of Gas-Fired Commercial Water Heating Equipment in Foodservice Facilities
*https://babel.hathitrust.org/cgi/pt?id=uc1.31822039658588&view=1up&seq=1*

## General Considerations to Reduce Water Use

The transition to water efficient practices and procedures relies on the successful implementation of processes that achieve and monitor the following:

- Training staff on the proper use of equipment and selecting efficient equipment
- Prompt reporting of malfunctions and leaks and systems to ensure these problems are addressed swiftly
- Tracking water use and water, wastewater, pretreatment, and energy costs associated with water

## Selection of Food Service Equipment

The selection of water and energy efficient equipment is a cornerstone of minimizing water and energy costs. There are many water efficient equipment options available on the market. In this section, the following types of equipment will be discussed:

- Refrigeration and Freezer Equipment
- Ice Makers
- Water Using Cooking, Preparing, Serving, and Holding Equipment
  a. Food Steamers and Combination Ovens
  b. Steam Kettles
  c. Pasta Cookers
  d. Woks
  e. Steam Tables
  f. Food Prep Sinks
  g. Reverse Osmosis Filtration System
- Scullary Operations
  a. Three Compartment Sinks
  b. Pre-rinse Spray Valves and Sluice Troughs
  c. Food Waste Disposal Methods
  d. Pot Soakers
  e. Commercial Dishwashers
  f. Dipper Wells
- Washing and Sanitation
  a. Floor Washing
  b. Hood Washing
  c. Washing Outdoor Areas
  d. Hand Washing Sinks

## Refrigeration and Freezer Equipment

**Commercial Refrigerator**


Air-cooled refrigeration equipment is the most common type of equipment found in food service facilities. In some cases, this equipment can be connected to the chilled water system.

***In cases where facilities have cooling towers as part of their air conditioning system, it is important to choose the most efficient equipment to reduce the heat load on the cooling tower.***

Ice cream, gelato, and frozen beverage equipment and similar equipment should always be air-cooled. Refrigeration equipment can also play a significant role in reducing the use of water to thaw food (see previous section on water efficient practices). Ensuring proper capacity to thaw food in a refrigerator is a water conservation method.

***Once-through cooling systems, sometimes called single-pass cooling, are prohibited in California and in all modern plumbing codes.***

## Ice Makers

**Commercial Ice Maker**

Ice making equipment can be either air or water cooled. Neither the EPA or the California Energy Wise program list water-cooled equipment and once-through cooling is prohibited in California and all modern green plumbing codes. However, the Federal Energy Management Program does allow water-cooled ice makers if the water is hooked to a chilled water or cooling tower water circuit.[2] Ice making equipment is rated on how many pounds of ice the machine makes in one day. One hundred pounds of ice is equivalent to 12 gallons of water.

There are two types of ice makers: batch type and continuous.

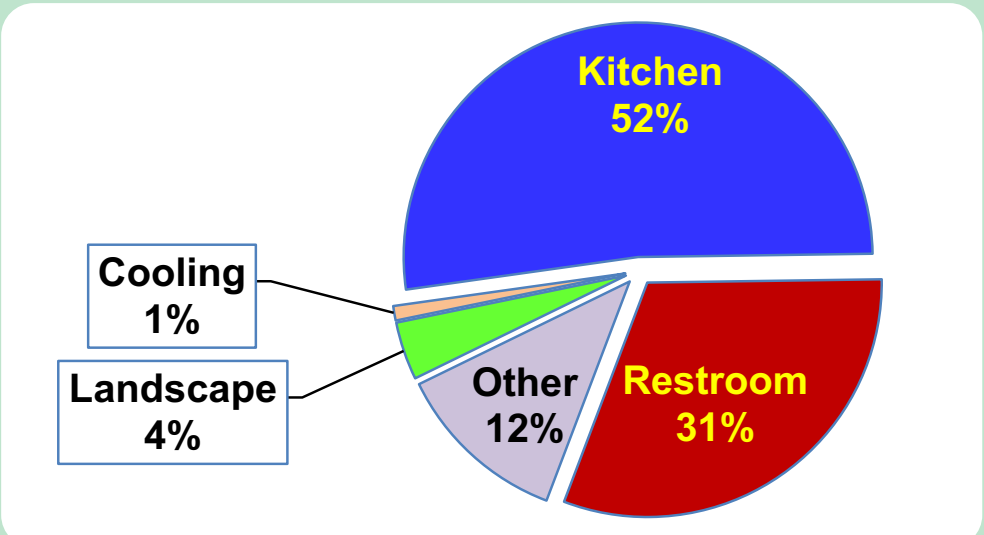
- **Batch type (cube)** ice makers produce a hard cube that has been rinsed to remove minerals that may precipitate out in the freezing process. Water is frozen in small ice trays and rinsed in the last phase of the process. The ice trays are dumped into the ice bin when finished.
- **Continuous type** ice makers have a rotating drum. Water freezes on the inside of the drum where it is scraped off with an auger in the form of flakes of ice. This equipment operates continuously. Flake ice is often used in operations such as salad bars. The flake ice can be formed into shapes for use in drinks.

**Methods of cooling ice makers:**

- **Water-cooled** ice makers can be cooled by simply passing tap water through a heat exchanger and dumping it into the sanitary sewer. This is called pass-through or once-through cooling. The heat exchanger can also be connected to a chilled water loop or cooling tower loop.
- **Air-cooled** ice makers can reject the waste heat generated into the room where it is located. These are called “ice making heads” (IMH). The compressor part of refrigeration equipment can also be located outside, similar to home air conditioning units. These are called “remote condensing units” (RCU). This type of ice maker rejects compressor heat to the outside. Another type of air-cooled ice maker is the self-contained, smaller, under the counter ice maker (SCU).

The Air Conditioning Heating and Refrigeration Institute (AHRI) lists both air- and water-cooled ice makers and information about water use for different ice makers is available through their website.

**TABLE 9-2: Typical Water Use in Restaurants**




2 *https://www.energy.gov/eere/femp/purchasing-energy-efficient-water-cooled-ice-machines*

**Recommendations**

- Purchase only air-cooled EPA certified ice makers meeting US Environmental Protection Agency – Energy Star criteria. Energy Star program criteria for ice makers can be found here
- Consider remote head equipment to reduce heat buildup in the building
- Use continuous ice makers that use less energy and water than batch/cube machines

## Water Using Cooking, Preparing, Serving, and Holding Equipment

This section describes water conservation best management practices for the following equipment:

- Food Steamers and Combination Ovens
- Steam Kettles
- Pasta Cookers
- Woks
- Steam Tables
- Food Prep Sinks

## Food Steamers and Combination Ovens

**Combination oven**


These two types of equipment are used to cook food using steam. Food steamers can only use steam to cook food while combination ("combi") ovens can cook either in steam mode or dry mode like conventional ovens. Combination ovens also have a feature where moisture can be injected into the cooking cavity during baking to keep the food from drying out. For both types of equipment, there are boiler and boilerless options. There are also pressure and vacuum options available for total pressure and temperature control.

Boiler type steamers and combi ovens use a separate boiler that produces steam. This boiler often requires that water feeding it is softened or otherwise treated to make it usable with the appliance. Because the boiler type steamers and combi ovens must be connected to both a water supply and sewer line, setting one up is costly and location options for installation in the kitchen are limited. They also require that makeup water be treated to remove minerals that can be deposited on the boiler surfaces and require regular descaling to remove deposits. When gas is used, the combustion gases must be vented. Boiler type steamers and combi ovens also require that water be purged from the boiler at the end of each run time and produce condensate that must be sent to the sanitary sewer. Plumbing codes[3] require that water discharged to the sewer be below 140°F.

To accomplish this, most steamers and combination ovens operating in steam mode run potable cold water continuously down the drain to ensure that the discharge is below 140°F.

Depending on the design and size, boilers can hold from three to over fifteen gallons of water which is dumped every time the equipment is turned off. During the cooking process, steam condensate is constantly discharged. Many steamers automatically open a valve to run water down the drain continuously while in operation to ensure that adequate cold water is flowing to achieve 140°F or less. Water tempering devices are available that only allow tempering water to flow when hot water is present. Costs for the tempering kits are in the range of $1,000 to $2,500.

Boiler type steamers are typically only used where a variety of items must be cooked on-demand since they have a faster recovery time, but if a set menu or quantity of food is produced or a feasible plan is created for facilities where food is cooked on-demand, boilerless steamers and combi ovens are a great alternative.

3 *https://forms.iapmo.org/email_marketing/codespotlight/2018/Nov15.htm*

***Boilerless steamers use significantly less energy and water and do not require tempering water at all.***



The Federal Energy Management Program, based on Food Service Technology Center data, reports that **boiler type steamers typically use 30 times more water than boilerless type steamers.**[4]

Boilerless steamers only require a power source and that a reservoir be filled manually. Since they use a closed system, steam condensate is re-boiled for multiple uses.

Benefits of boilerless steamers and combi ovens include:

- 30 times less water used than boiler-type steamers
- No tempering water needed
- Much less energy use in the steam mode for combi ovens – some report up to 75 percent savings
- No need for expensive water pretreatment
- No need for water and sewer connections
- Fewer moving parts to break
- Ease of cleaning

**Recommendations**

- Prioritize boilerless steamers and combination overns wherever possible
- Only use boiler type equiment where absolutely necessary
- Look for the EnergyStar label when purchasing equipment
- Consider installing water tempering devices on boiler type discharges
- Do not turn on the steamer until ready to cook. Only use the steam compartments that are needed
- Keep in mind that steamers require 15 minutes or less to preheat
- Cut down idle time on boiler steamers
- Maintain the equipment with regular maintenance checks:
- Inspect door gaskets. A badly aligned door hinge can let steam escape, increasing business costs on water and energy, and increasing cooking times.
- Cool full loads of food in the combi oven whenever possible

## Steam Kettles

Steam kettles are used to cook large volumes of food. There are two types of steam kettles:

1. Steam can be either provided by remote boiler or
2. By a self-contained boiler, where food and water are loaded into the kettle and the jacket around the kettle is heated with steam.

When a remote boiler is used, steam condensate should be returned to the boiler. For self-contained boilers, condensate is automatically returned to the boiler in most cases. Softened and often demineralized water is used to feed self-contained boilers. Remote boilers also require specially treated water.

**Recommendations:**

- Purchase steam kettles with self-contained boilers when possible
- Where a central boiler is used to provide steam, ensure that steam condensate is returned to the boiler
- Ensure that the drain valve does not leak which can easly happen if food lodges in the valve
- Train staff to properly clean the kettle with water savings in mind

## Pasta Cookers

Pasta cookers are designed to boil water and cook pasta. The principal is straightforward: water is boiled and pasta is placed in the boiling water to cook. Water needs to be dumped and replaced only when the starch content of the water is too high and causes excessive foaming.

When buying a pasta cooker, it is important to consider the volume of water needed for pasta at the food service operation. In a small venue not focused on pasta service, a smaller pasta cooker that holds about 2 to 3 gallons should be considered. Larger venues where pasta is a major component of what is served should consider a

4 *https://www.energy.gov/eere/femp/water-efficient-technology-opportunity-connectionless-food-steamer*

larger floor model that can hold up to 12 gallons. Pasta cookers can also hold more than one vat for cooking. Since the cooker water can reach over 140°F, it must be cooled prior to discharge. Allowing water to sit and cool at the end of the day prior to discharge will save water, rather than using tempering water.

**Recommendations**

- Adjust the equipment temperature to just high enough to cook pasta to save water and energy (simmer or slow boil)
- Only refill when starch content limit is reached
- Select equipment with overflow controls
- Allow water to cool before dumping so tempering water is not needed
- Train staff on the proper ways to operate a pasta cooker

## Woks

Woks are used to cook items in oil at high temperature. Using conventional woks requires a continuous water flow over the stove surface where woks are being used to keep temperatures low enough for cooks. This water is typically discharged to the sewer once it flows over the stove top.

Waterless woks are available. In this type of wok, the top of the stove is insulated so cooling water is not needed. Waterless woks also require less maintenance and corrosion damage is reduced, according to an Australian study.[5]

**Recommendations**

- If possible, use waterless woks
- If conventional woks are used, a “knee bump” valve can be installed so water is only used when someone is at the stove cooking
- Adjust flows to the minimum amount needed if using a conventional wok

## Steam Tables

Steam tables have been a common piece of equipment on food serving lines for decades. These are used to keep food above 140°F so it is safe to eat. Health codes require this temperature for hot foods on serving lines.

**Steam Tables**

These tables have three working parts:

- They can hold significant volumes of very hot water
- The water is kept hot with either electric or gas heat.
- Trays of hot food are placed in the open “wells” to keep the food hot.

At the end of each meal cycle, the water is dumped. Both open-well and sealed-well tables are available. The difference is that sealed-well tables have built-in tray containers to hold the food trays without coming into contact with the hot water. Large steam tables can hold over 100 gallons of water.

***The discharge of hot water at the end of a serving cycle must be controlled so as not to exceed 140°F when being drained into the sewer.***

Dry serving line equipment that does not use hot water to keep the food at adequate temperature is available.

**Recommendations**

- Use dry serving equipment wherever possible
- If steam tables are used, minimize the water level and reuse the hot water that is dumped for mopping and other cleaning uses

5 *https://p2infohouse.org/ref/50/49033.pdf*

## Scullary Operations

This section describes water conservation best management practices for the following equipment:

- Three Compartment Sinks
- Pre-rinse Spray Valves and Sluice Troughs
- Food Waste Disposal Methods
- Pot (Power) Soakers
- Commercial Dishwashers
- Dipper Wells

**TABLE 9-3: Spray Valve Comparison**

| Nozzle Rated Flow (Gallons per Minute) | 1.6 | 1.28 | 1.2 | 1.0 |
|---|---|---|---|---|
| **Daily Usage (hrs.)** | 3 hours | 3 hours | 3 hours | 3 hours |
| **Gallons per Day** | 288 | 230 | 216 | 180 |
| **Gallons Annually** | 105,120 | 84,096 | 78,840 | 65,700 |

### Three Compartment Sinks

Thee compartment sinks are the workhorse of the food service industry. These multi functional sinks are most commonly used to wash cooking utensils, pots and pans, and other kitchen ware. They come in several configurations but the classic dish washing configuration is to use the first compartment for soapy water, the second to rinse, and the third to hold a disinfectant solution. The most important water conservation technique for three compartment sinks is to train employees on proper ways of using the sink.

**Three Compartment Sink**


### Recommendations

- Do not overfill the basins
- Turn water off when not needed
- Do not use three compartment sinks for washing hands
- Promptly report faucet leaks and other malfunctions

### Pre-Rinse Spray Valves and Sluice Troughs

Pre-rinse spray valves are used to spray and remove food wastes prior to placing the plates, pots and other food service ware in the dishwasher. The food waste is either washed directly into a food waste grinder or into a sluice trough. A sluice trough washes food waste into the grinder where the food waste is ground up and washed into the sanitary sewer. The WaterSense threshold established by the Department of Energy limits the flow rate for pre-rinse spray valves to under 1.28 gallons per minute.[6] Hot water is often used for pre-rinse spray valves.

If hot water is used with a spray valve, the valve consumes both energy and water. In a large restaurant serving breakfast, lunch, and dinner, such a valve may have as many as four hours of continuous use. Table 9-3 that compares different flow rates of spray valves and their water use.

6 *https://www.epa.gov/watersense/pre-rinse-spray-valves#:~:text=The%20U.S.%20Department%20of%20Energy,energy%20regulation%20covering%20these%20devices*

### Recommendations

- Eliminate or minimize the use of sluice troughs and reduce their flow to a minimum
- Install pre-rinse spray valves that use less than 1.28 gallons per minute
- Do not keep the valve on continuously
- Follow recommendations for food waste disposal in the next section
- Wait until the dishwashing rack is completely full before sending it through a mechanical dishwasher
- Presoak utensils and dishes instead of rinsing them under running water

### Food Waste Disposal Methods

There are three methods to dispose of food waste, commonly referred to as food scraps, produced during food service preparation and dishwashing operations:

1. Via a commercial compost pickup service/facility
2. Via the solid waste stream
3. Into wastewater
4. Guidelines established by local jurisdictions should be referred to when planning to dispose of food waste in solid food waste containers (because of potential problems with insects and rodents) and in general when devising food waste disposal systems. ome common methods of disposing of food waste used by food service operations are:

    - Composting Options
    - Food Grinders (disposers)
    - Mechanical strainers
    - Pulpers
    - Strainer baskets

### Composting

As of January 1, 2022, people and organizations throughout California are required to separate organic material (mainly food scraps and yard waste) from other garbage[7]. Composting is the natural process of breaking down biodegradable materials into a rich soil known as compost. Materials can include not only organic matter such as vegetables, but also biodegradable packaging such as food-soiled cardboard boxes or compostable-certified films and bags.

**Composting Options**


Under SB1383, commercial properties in California must:[8,9]

- Get Service – sign up for organics recycling
- Set Up Indoor Bins – complete with color-coded bins and labeling
- Sort Correctly – materials must be placed in proper bins
- Donate Surplus Food – some businesses, such as large restaurants, must recover and donate surplus food

Commercial food service establishments must therefore structure their food preparation and disposal workflows to prioritize composting. For readers in areas without mandatory composting requirements, such voluntary practices may still confer water savings.

### Food Grinders (Disposers)

The operation of food waste grinders in food service operations is the same as home disposer operation. Food

7 *https://www.californiacompostlaw.com/*
8 *https://www.stopwaste.org/rules/overview*
9 *https://www.cccrecycle.org/224/SB1383-Organic-Waste-and-Edible-Food-Rec*

waste enters the grinder and mixes it with water which is then discharged to the sanitary sewer. Grinders of different horsepower and water flow rates are available.

### Mechanical strainers

Mechanical strainers have large strainer baskets that catch food waste for disposal. Water is drained into the sanitary sewer or can be recirculated for rinsing plates and other items before placing them in the dishwasher. This eliminates the need for a pre-rinse spray valve in many cases. Since food solids are strained from the waste stream, they require less water per minute than garbage grinders and use less electricity. The food solids can be disposed of along with other solid waste from the facility or diverted to a composting operation.

### Pulpers

Pulpers use an extruder screw to squeeze water out of food wastes. Like the mechanical strainers, this equipment can include a recirculation feature that recirculates water to wash food waste from plated and other items. Water removed from the food is either sent to the sanitary sewer or a limited part of the water is recirculated. These systems have the advantage of removing solid waste, fats, oils, grease, and other components from the wastewater. According to manufacturers' literature, they can also recirculate up to 75 percent of the water to the head of a sluice-trough system. The food solids can be disposed of along with other solid waste from the facility or diverted to a composting operation.

### Strainer Baskets

Strainer baskets are one of the least energy and water intensive technologies for capturing and diverting food waste from the sanitary sewer, as they require no water use. They can replace mechanical operations such as garbage disposals, and thus eliminate the water use associated with those technologies[10]. Strainer baskets can be installed in sink drains and in tandem with pulper systems.

## Comparison of Disposal Methods

When comparing food waste disposal techniques, three considerations need to be made:

- Water and Energy Use
- Overall Resource Use
- Ease of Staff Use

Table 9-4 shows the basic considerations when choosing a method of food waste management. The pre-rinse spray valve and grinder combination is the most common method used by food service facilities, however, it tends to have the most energy and water use, especially if sluice troughs are used. Both mechanical strainers and pulpers produce a wet concentrated waste stream and use energy and water, although less than a food grinder trough system. Strainer baskets require the least amount of energy and water inputs. Mechanical strainers and pulpers use less water and energy than grinders. From a staff standpoint, a disposer – trough – pre-rinse spray valve system may require less work, while the other three systems require about the same amount of human effort.

***Understanding that each application has unique needs, the table is intended to be a decision-making matrix, with each facility choosing the least energy and water intensive options that continue to meet their specific requirements.***

### Recommendations

- The most efficient food disposal method is to compost food waste directly rather than relying on a food disposal device. If in California, refer to your local city or other jurisdiction's specific compliance process with the Compost Law
- Use strainer baskets for the lowest water and energy use and the potential to compost
- If food grinders, pulpers, mechanical strainers, and/or food waste disposers are used, ensure they have a time out system with push button to reactivate. The maximum allowable run time cycle shall be 10 minutes[11]
- Sluice troughs should have automatic shutoffs

## Pot (Power) Soakers

Pot or power soakers are often use in food service establishments where many pots, pans and casserole dishes must be washed. These systems are comprised of large stainless steel vessels filled with hot soapy water. This combination of hot water and soap softens and helps remove baked on food materials. It also reduces the time employees must scrub such items and how long pre-rinse spray valves may be needed. After soaking, the items can be hand washed in a three compartment sink or placed in a dishwasher. The water used in this system is maintained at a temperate of 115°F to 120°F and the water is vigorously recirculated.

10 *https://www.epa.gov/system/files/documents/2023-05/ws-commercial-watersense-at-work_Section_4.9_Food_Disposals.pdf*
11 *https://epubs.iapmo.org/NSPC/2021/*

**TABLE 9-4: Food Waste Disposal Technologies**

| Impact of Technology | Grinder | Mechanical Strainers | Pulper | Strainer Basket |
|---|---|---|---|---|
| **Solids to Sewer** | Yes | No | No | No |
| **Recirculate** | No | Yes | Yes | No |
| **Strain Solids Recovered** | No | Yes | Yes | Yes |
| **Compost Possible** | No | Yes | Yes | Yes |
| **Flow Restrictor** | Yes | No | No | N/A |
| **Horse Power** | 1-10 | 0.75-7.5 | 3-10 | 0 |
| **GALLONS PER MINUTE (Potable only)** | 3-8 | 1-2 | 1-2 | 0 |
| **Sluice Trough GALLONS PER MINUTE** | 2-15 | 2-15 | 2-15 | 0 |
| **Water Recirculation** | No | Yes | Yes | N/A |

The main function of a pot or power soaker is to save employee cleaning time. Typical dimensions vary. Some systems are configured with a rinse and sanitizer sink following the power soaker. Water use depends on the depth to which the soaker is filled and the number of times it is dumped and refilled.

**Recommendations**

- Keep water levels as low as possible
- Only dump and refill when water becomes laden with food particles

## Dipper Wells

Dipper wells have been used for decades to rinse and hold ice cream scoops and other serving utensils between uses. Traditional dipper wells operate by having a constant stream of potable water flow over the utensils and down the drain. In a 2017 study by Frontier Energy,[12] dipper wells in ice cream shops, juice shops and restaurants used over 500 gallons of water a day. A potential problem with traditional dipper wells is that the valve can be left on when the well is not in use.

The dipper well is a tool of convenience and can easily be replaced with a number of available alternative technologies. Options include cleaning procedures such as shower rinse for the scoop, or a heat utensil holder that maintains a minimum water temperature of 135°F. The above-referenced Frontier Energy report describes some of these alternatives.

The California Energy Commission is currently considering updated appliance efficiency regulations for dipper wells. The California Investor-Owned Utilities (CA IOUs) advocate for establishing a maximum flow rate of 0.2 gallons per minute at a supply pressure of 60 pounds per square inch[13]. This recommendation "aligns with both the 2023 International Association of Plumbing and Mechanical

12 *https://www.bewaterwise.com/assets/2015icp-dipperwellfrontierenergy.pdf*
13 *https://efiling.energy.ca.gov/GetDocument.aspx?tn=260581&DocumentContentId=96883*

Officials (IAPMO) Water Efficiency and Sanitation Standard (WE-STAND)[14] and 2024 IAPMO Uniform Plumbing Codes."[15]

### Recommendations

- Use one of the alternatives to dipper wells now available
- Consider rinsing scoops under a faucet with a 0.5 gallons per minute aerator
- If dipper wells are used, install a flow restrictor to adjust the flow to a maximum of 0.2 gallons per minute
- Ensure staff knows that dipper well faucets should be shut off at the end of the work day
- Store ice cream scoops that require a dipping well in hot water (140°F or above) or in the ice cream itself with the handle out (each flavor must have its own individual scoop)

## Dishwashers

Dishwashers can be assessed by machine type and method of sanitation they use. Operational considerations are discussed below.

### Method of Sanitation

There are high temperature and low temperature dishwashers (also known as chemical sanitizing machines). High temperature systems use hot water to sanitize dishes while chemical types use chlorine compounds.[16] Chemical sanitizing systems tend to use more water per rack than high temperature systems. The EPA Energy Star program classifies dishwashers into high temperature and low temperature type categories.

Energy Star requirements for energy and water use are shown in Table 9-5. Note that a "rack" is a 20 inch by 20 inch rack where dishes and ware are placed to be inserted into the washer.

### Machine Type

As the table above shows, there are many machine types:

- Under the counter machines
- Door-type dishwashers that allow a rack of dishes to be placed in the washer
  - Wash cycles typically last from one to three minutes
- Conveyor systems that pull the racks through the machine
- Flight type washers that operate by continuously pulling pegged racks of ware to be washed through the machine. Washing is complete in one to three minutes.
  - These systems are designed for very high volume operations; typically found in large institutional facilities such as hospitals and large hotels with banquet facilities

**TABLE 9-5: Energy Star Requirements for Energy and Water Use**

| Machine Type | High Temp Efficiency Requirements | | Low Temp Efficiency Requirements | |
|---|---|---|---|---|
| | Idle Energy Rate* | Water Consumption** | Idle Energy Rate* | Water Consumption** |
| **Under Counter** | ≤ 0.30 kW | ≤ 0.86 GPR | ≤ 0.25 kW | ≤ 1.19 GPR |
| **Stationary Single Tank Door** | ≤ 0.55 kW | ≤ 0.89 GPR | ≤ 0.30 kW | ≤ 1.18 GPR |
| **Pot, Pan, and Utensil** | ≤ 0.90 kW | ≤ 0.58 GPSF | n/a | n/a |
| **Single Tank Conveyor** | ≤ 1.20 kW | ≤ 0.70 GPR | ≤ 0.85 kW | ≤ 0.79 GPR |
| **Multiple Tank Conveyor** | ≤ 1.85 kW | ≤ 0.54 GPR | ≤ 1.00 kW | ≤ 0.54 GPR |
| **Single Tank Flight Type** | Reported | GPH ≤ 2.975x + 55.00 | n/a | n/a |
| **Multiple Tank Flight Type** | Reported | GPH ≤ 4.96x + 17.00 | n/a | n/a |

14 *https://iapmo.org/newsroom/press-releases/2023-iapmo-water-efficiency-and-sanitation-standard-now-available*
15 *https://epubs.iapmo.org/2024/UPC/*
16 *https://www.anfponline.org/docs/default-source/legacy-docs/docs/ce-articles/fpc112017.pdf*

### Dump and Fill vs. Recirculation

Most door type dishwashers are dump and fill type machines. Conveyor and flight types can recirculate water form the rinse cycle for the first wash if they are multi tank types. Multi tank washers are more water efficient.

### Operational Considerations

- In busy food service operations where large amounts of racks are washed small differences in gallons used per rack becomes important
- Employees  failing to fill dish racks completely is a practice that wastes water
- The restaurant industry makes extensive use of refurbished dishwashers. Many of these older refurbished models are far from water efficient

### Recommendations

- When leasing or purchasing equipment, always specify that the dishwasher meets Energy Star criteria
- Do not allow leasing entities to install old, non-qualified equipment, and instruct them to set the equipment for energy and water efficient operations
- Train staff in how to properly operate the equipment
- High temperature machines are more water efficient in general
- Use multi-tank washers where possible
- “Fill and dump” style machines are not recommended

## Washing and Sanitation

- Floor Washing
- Hood Washing
- Washing Outdoor Areas
- Handwash Sinks
- Clean in Place Systems

**Mop Sink**


### Floor Washing

Cleaning floors in kitchen, dining, and restroom areas is a reccuring operation. A customary practice is to mop the kitchen floor with soapy water and use a high-pressure hose with hot water to rinse the soapy water into the floor drain. Squeegees are an alternative for the removal of excess soapy water without the need for additional clean water. Where the floor is full of tables and chairs or food preparation equipment, mopping is often the only choice for cleaning. When cleaning items such as meat processing equipment or floors with a lot of grease and oils, pressure washing may be necessary. In these cases, high pressure equipment that sprays both cleaning chemicals and high-pressure water can be used. Pressure washers with hoods that contain the spray and minimize water use can be used, and some have a vacuum adaptation that will vacuum up the wash water.

Where floor space is more open and permits, floor cleaning machines that both clean and squeegee used water are available and are one of the most water efficient ways to wash floors.

### Recommendations

- Ensure that all spray type equipment is equipped with self-closing nozzles
- Avoid using garden hoses without a nozzle
- Choose water efficient floor cleaners that both wash and squeegee the floor
- Choose pressure-washing equipment for floor and floor-mat washing
  - If hot water pressure washers are used, ensure that they use 2.5 gallons per minute or less
- Use floor-cleaning machines on smooth surfaces
- Arrange equipment so squeegeeing can be done easily

### Hood Washing

Hoods over cooking equipment are found in most food service establishments. The hoods collect grease and other fire hazard material. Hand cleaning of hoods is time-consuming, whereas hood washer systems offer a convenient way to clean a variety of hoods.[17] The hood washer sprays soapy hot water over the grease-extractor systems after the hood is turned off. Timing can be pre-set depending upon the amount of grease that collects.

Hood washers may or may not use less water than conventional manual cleaning methods, depending upon the frequency of washing and how the water use with the hood system compares to water use of manual cleaning, usually done with a pressure washer. Hood systems may save water when properly operated.

### Washing Outdoor Areas

Outdoor areas including outdoor eating areas, areas around dumpsters, food delivery truck areas, and other hard surface areas around a facility can often only be cleaned by washing. In general, sweeping is encouraged, but if water is needed a comparison of water broom flow rates to other equipment flow rates (such as hose nozzles or industrial wash down sprayers) should be made to decide on the best equipment to use.

### Recommendations

- Sweep or use a leaf blower where possible
- In some jurisdictions, allowing wash water with detergents and/or chemicals is prohibited. In these cases, use cleaning techniques that also vacuum up the wash water.
- Use water brooms where runoff is not an issue.
- Water use should be limited to 3.0 gallons per minute or less.
- Limit low volume pressure washer use
- Do not use a garden hose without a shutoff nozzle

### Handwash Sinks

Upgrading to 0.5 gallons per minute aerators in all kitchen handwash sinks can save significant water saving impact since hand washing is constant in food service establishments. Installing automated features for kitchen faucets can also help conserve water, such as motion sensor or hands free (foot or knee activated) faucets.

**Upgrading the Aerator for a Handwash Sink**

17 *https://hvac-blog.acca.org/understanding-commercial-kitchen-exhaust-hoods/*

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