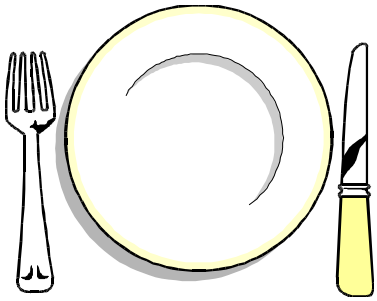
water efficiency

Water Management Options

Kitchen and Food Preparation



Although commonly overlooked, there are many ways to reduce water usage in the kitchen. Traditionally, saving water has not been a major consideration of commercial food preparers. Many establishments cite the lack of money or employees as reasons for not using water conservation methods. Case histories have shown that water efficiency programs are cost-effective, and most initial costs are retrieved within a two-year period. Participation in water efficiency programs shows that there is a concern for efficient water. These programs are supported by local communities.

Inefficient uses of water in kitchen operations come mainly from two areas: equipment design and behavioral patterns. The main types of water-using equipment found in kitchens are dishwashers, faucets, ice-making machines, and garbage disposal use. Improved technology has eliminated many of the water issues associated with equipment, as more rigid standards have been created to curtail excessive water use. Water audits of commercial facilities have shown that 60 percent of identified

water savings comes from simply installing faucet aerators in all kitchen sink outlets. An effective part of water savings in kitchens is attributed to behavioral patterns in facilities. Awareness programs, education, training, and job performance measures can influence proper behavioral patterns of staff.

Dishwashers

All dishwashing machines employ wash, rinse, and sanitizing cycles. The sanitizing cycle typically is the chemical reduction of microorganisms to safe levels on any food utensil. The time taken for a dishwasher to complete a cycle is a combination of mechanical action, water temperature, and chemical action. Most dishwashers use between 2.0 and 7.0 gpm for a complete cycle of cleaning and sanitation. Hot water use varies with the pressure of supply lines, operation speed of the machine, and dish table layout. All these variables are intrinsically linked and any adjustments affect each component. For example, rapid washing cycles necessitate stronger mechanical action and more concentrated detergents for cleaning.

CASE STUDY

A study of 605 industrial water efficiency programs by the Metropolitan Water District of California estimated that facilities cut kitchen/cafeteria water use by 32 percent, yielding a saving of nearly 100,000 CCF of water per year.

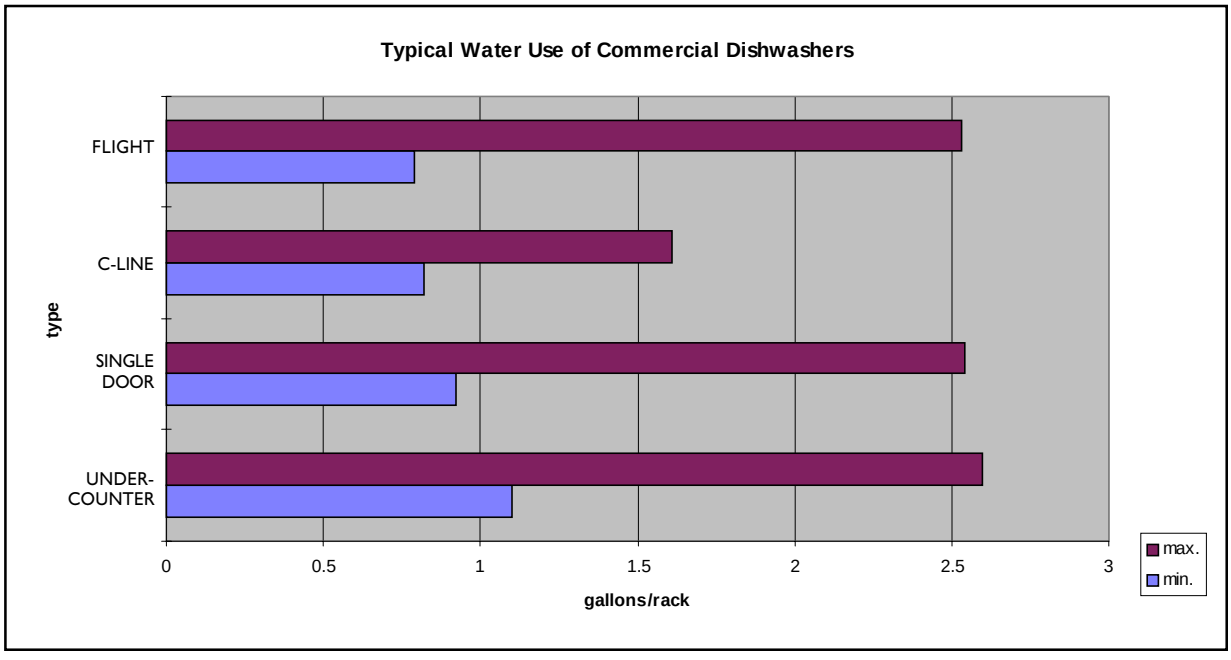
Types of Dishwashing Machines

There are four main types of dishwashing machines: undercounter, door, conveyor, and flight. A wide array of models and accessories are available for each category. Requirements for machine size can be calculated by estimating the amount of traffic that will be served in the food service area. Energy guidelines and water consumption levels for dishwashers are becoming stricter, and many manufacturers offer new water-saving models. Figure 1 illustrates typical water use ranges for each type of dishwasher normalized on a "per rack" basis. Most importantly, note the wide range of water use in each dishwashing category. Using an appropriately sized, water efficient model will save a significant amount of water.

Undercounter

Smallest of commercial dishwashers, undercounter dishwashers are best suited for small establishments of about 60 people. They commonly are used in nursing homes, churches, small food service areas, office buildings, and for glass washing in taverns and

FIGURE 1



bars. The undercounter machines are similar to residential dishwashers in that the door opens downward with rack(s) rolling out onto the lowered door for access.

A revolving wash arm handles the wash and rinse cycles, with a small holding tank being automatically drained after each cycle. An automatic timer controls cycle length. Undercounter machines come in both hot water and chemical sanitizing models, with optional booster heaters for the latter. As can be seen in Figure 25, undercounter machines use the most water per rack of all commercial dishwashers. This illustrates the need to wash only full racks when the machine is in use.

Door-type

Manufactured to service 50-200 people, door type machines are the most widely used of commercial dishwashing machines. Door machines are used in schools, hospitals, churches, restaurants, catering businesses, fast-food establishments, and as glass and utensil units in larger operations. These box-shaped machines have singular or multiple doors that slide vertically for loading and unloading. Door type machines are available in high temperature and chemical sanitizing models. These "dump and rinse" machines have a single tank for water and detergent, which are circulated in measured volumes and temperatures. Two revolving spray arms (one above and one below the dish rack) distribute wash solutions evenly over the dishes. Some door-type machines now have the ability to recycle rinse water to be reused in a wash cycle.

C-line Conveyor, Rack

C-line, or rack conveyor, machines use a motor-driven conveyor belt to move the rack-loaded dishes through a large tank with separate wash and rinse compartments. Most widely-used in hotels, large restaurants, hospitals, schools, and universities, these machines are well suited for service of 200 or more people and accommodating most heavy food service operations.

C-line machines come in varying sizes, with available additions such as pre-wash units, side-loading trays, condensers, and blower-dryers. A single tank holds

Types of dishwashing machines

- undercounter
- door-type
- C-line conveyor, or rack
- flight type

the water and detergent at a regulated temperature. The wash solution is pumped through multiple spray arms (revolving or stationary) that run constantly once the machine is operational, regardless the presence of a dish rack. The rack is then sent through the rinse compartment, where it is sprayed with the 180 F water by spray nozzles above and below the rack. C-line machines with multiple tanks differ in that some use stationary versus rotating spray arms. The racks then are sent into a pump-driven rinse tank that rinses the dishes heavily. This process usually uses recycled water from the final rinse. All rack conveyor machines have a timer control for the speed of the conveyor to assure proper wash and rinse times.

Water efficient measures, such as the installation of an electric eye sensor (that keeps the conveyor from running when there are no dishes on the racks), have started to make rack conveyors more energy- and cost-effective. Some efficient conveyors can reduce final rinse consumption from 300 gph to 130 gph. The use of energy-efficient boosters and low-flow pumps can reduce energy and water consumption levels by 50 percent.

Flight type

Similar in that they use a conveyor belt to move dishware, flight type machines do not have racks. Rather, dishes are loaded directly onto the belt. Flight type dishwashers provide high-volume washing capability needed only in the largest institutional, commercial, and industrial facilities. Variations in possible machine additions include power scrapers, power wash, power rinse, final rinse, and blower-dryers.

Water efficient strategies for these machines include the recirculation of final rinse water, electric eye sensors, extra-wide conveyors, and low-energy built-in

booster heaters. These additions have amounted to water savings as much as 47 percent, while maintaining loads of more than 14,000 dishes per hour.

Water Efficient Practices for Dishwashers

The volume of consumption in dishwashers can be reduced by a variety of practices, all of which target awareness of equipment and operation needs.

Behavioral Modifications

- Educate staff about the benefits of water efficiency and the importance of hand scraping before loading a dishwasher.
- Instruct staff to quickly report leaks and troubleshoot.
- Only run rack machines if they are full.
- Try to fill each rack to maximum capacity.

Mechanical Modifications

- Recycle final rinse water for washing.
- Keep flow rates as close as possible to manufacturer specifications.
- Install "electric eye sensors" to allow water flow only when dishes are present.
- Install door switches for convenient on/off access.
- Check voltage of booster heater to make sure it fits the machine.
- Use "steam doors" to prevent water loss due to evaporation.
- Install low-temperature machines that rely on chemical sanitizing over high water temperature.
- Check volume of service and estimate facility needs — a better option may be a larger machine that has a lower water flow rate per rack.

Kitchen Faucets and Pre-rinse Sprayers

Faucets can waste large amounts of water, as they are the most heavily used water source in kitchens. Conventional faucets, with typical flow rates of 2.5 to 4.0 gpm, can waste as much as 40 gallons of water a day when not fully closed. Since 1994, water efficiency standards have been federally mandated, requiring that all post-1994 manufactured faucets consume a maximum of 2.5 gpm at 80psi. But many facilities have older fixtures with rubber gaskets that wear and deform because of high amounts of hot water use. By simply installing a brass gasket and an automatic shut-off nozzle, a facility could save as much as 21,000 gallons of water per year. Many adjustments and technology advancements have been made in faucet design as a variety of low-flow faucet types are manufactured. Foot-activated kitchen faucets will reduce water use while providing additional convenience. Faucets used in kitchens will be primarily the conventional type or pre-rinse pressure sprayers. There are a variety of modifications that can be employed for all types.

Water Efficiency Options for Kitchen Faucets

- Adjust flow valve to reduce water flow.
- Check for leaks and worn gaskets.
- Install a flow restrictor to limit maximum flow rate to 2.5 gpm or less.
- Install a 2.5 gpm faucet aerator, maximizing flow efficiency by increasing airflow to the stream.
- Consider infrared or ultrasonic sensors that activate water flow only in the presence of hands or some other object.
- Install pedal operated faucet controllers to ensure valves are closed when not in use.
- Educate staff to look for leaks and broken faucets in their area.
- Do not leave faucets on to thaw vegetables and other frozen foods.
- Post water conservation literature and reminders to staff around work areas.

Pre-rinse Sprayers

Pre-rinse sprayers are used for rinsing cooking utensils, pots, pans, soaking dishes, and cleaning. They are designed with automatic shut-off valves at

CASE STUDY

By installing a foot-actuated faucet, one food service facility reduced its monthly water usage by 3,700 gallons. This translated to annual savings of nearly $700.

the hose head to supply water only when needed. There are water-efficient spray valves offered that supply from 1.6-2.65 gpm at 80psi. These types of sprayers are designed to meet the demands of food service operations.

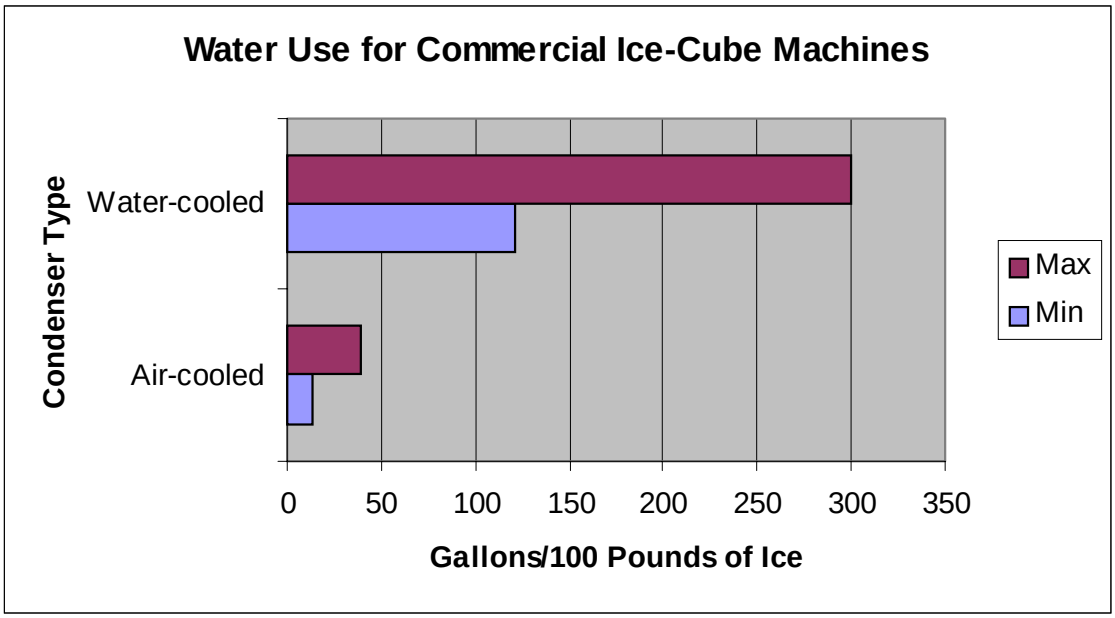
Ice Making Machines

Ice machines have many commercial uses, from restaurants to lodges, and can use significant amounts of water depending on the type of machine and the desired type of ice. Ice machines are composed of the following components: a condensing unit used for cooling, an evaporator surface for ice formation, an ice harvester, an ice storage container, and, in some models, a dispenser. The type of condenser an ice machine uses will have the largest effect on water use. Two types of condensers are available: air-cooled and water-cooled. Water-cooled machines use 10 times as much water as air-cooled machines and water rarely is recirculated. *(See Figure 2.)* In comparing water- and air-cooled compressors, the compressor horsepower at design conditions is invariably higher with air-cooled machining. However, operating costs frequently compare favorably during a full year. The desired quality and visual clarity of ice also will influence water consumption. Ice quality, machine cleaning, and water efficiency all need to be balanced for optimum operation.

Garbage Disposals

Studies show that garbage disposals can waste a significant amount of water. It is recommended that their use be minimized or eliminated from kitchen operations. Many facilities use strainers or traps that employ a mesh screen to collect food waste for proper waste treatment. Another option is to install strainers in sinks, leaving the food matter in the sink for disposal in trash receptacles or composting units.

FIGURE 2



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Other fact sheets available

from the Division of Pollution Prevention and Environmental Assistance

Reasons for Water Efficiency Efforts ▪ Sound Principles of Water Management ▪ Conducting a Successful Water Efficiency Program ▪ Water Management Options [*Sanitary/Domestic Uses; Cooling and Heating; Landscaping; and Cleaning, Rinsing, and In-Process Reuse*] ▪ Industry Specific Processes [*Textile; Food; and Metal Finishing*] ▪ Auditing Methodology and Tools ▪ Resources ▪ Self-Assessment Checklist ▪ Water Survey

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