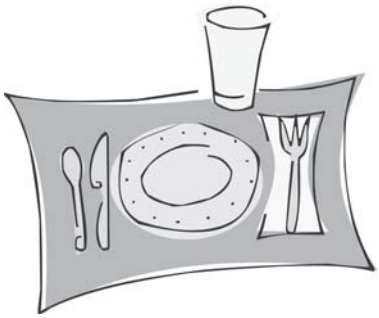
Water Efficiency

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 municipal water efficiency programs shows that the food preparation sector is interested in striving for high efficiencies in its water use.

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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 disposals. 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 2.2 gpm 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.

CASE STUDY

Geothermal Energy Use

The Proximity Hotel, located in Greensboro, has an innovative refrigerator system in its kitchen that uses geothermal energy instead of the conventional water-cooled systems, providing significant water savings.

FIGURE 4-12

Commercial Kitchen/Cafeteria Operations

Equipment	Type	Water Use			Savings Potential	Comments
		Traditional	Existing Standard	High Efficiency		
Commercial Dishwashers	Undercounter	1-1.8 gal/rack	No standard	1 gal/rack	Up to 0.8 gal/rack	Machines with an overall height of less than 36"; rack of dishes remains stationary within machine during sequential wash and rinse sprays. High temp machines are most water efficient.
	Stationary Single Tank Door	1.1-2.2 gal/rack	No standard	0.95 gal/rack	Up to 1.2 gal/rack	Includes machines commonly referred to as pot, pan and utensil washer. Also applies to machines in which the rack revolves on an axis during the wash and rinse cycles. High temp machines are most water efficient.
	Single Tank Conveyor	0.7-1.4 gal/rack	No standard	0.7 gal/rack	Up to.7 gal/rack	A single tank conveyor machine has a tank for wash water followed by a final sanitizing rinse and does not have a pumped rinse tank.
	Multi Tank Conveyor	0.54-1.2 gal/rack	No standard	0.54 gal/rack	Up to 0.58 gal/rack	Machines with one or more tanks for wash water and one or more tanks for pumped rinse water. Followed by a final sanitizing rinse.
Pre-rinse Spray Valves	Handheld hose-mounted dish sprayers	2-5 gpm	1.6 gpm at 60 psi		0.4-3.4 gpm	
Commercial Steam Cookers	Compartment Steamers	25-35 gal/hr	No standard	ENERGY STAR Qualified cookers average 2 gal/hr	Up to 33 gal/hr	

Dishwashers*

Commercial dishwashers, considered to be one of the largest water and energy consumers in a food service area, often use more than two-thirds of the overall kitchen water use. There are four main classes of commercial dishwashers: undercounter, stationary rack door type, rack conveyor and flight type. Each class of dishwasher may employ single or multiple wash tanks, and use hot water (high-temp machines) or chemicals (low-temp machines) to achieve final rinse dish sanitization. Requirements for machine class and size can be calculated by estimating the amount of traffic that will be served in the food service area.

Water usage across commercial dishwasher classes does not appear to be directly related to the size of the machine and varies from .33 gallons per rack to 20+ gpr. A typical commercial dishwasher uses approximately four gpr. Using an appropriately sized, water efficient model will save a significant amount of water.

Undercounter

The 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 and office buildings. 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. Hot water machines are the most water efficient.

Types of Dishwashing Machines

- Undercounter
- Stationary rack door
- Rack Conveyor
- Flight

Stationary Rack Door

Designed to service 50-200 people, stationary rack door machines are the most widely used for 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 one or multiple doors that slide vertically for loading and unloading. Stationary rack door type machines are available in both hot water and chemical sanitizing models. Hot water machines are the most water efficient. 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 distribute wash solutions evenly over the dishes. Some stationary rack door machines have the ability to recycle rinse water to be used again in a wash cycle.

Rack Conveyor

Rack conveyor, or c-line, machines use a motor-driven conveyor belt to move the rack-loaded dishes through a large tank with sepa

**Taken from the Alliance for Water Efficiency - Commercial Dishwashing Web site.*

rate 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, accommodating most heavy food service operations.

Rack conveyors come in varying sizes, with available additions such as pre-wash units, side-loading trays, condensers and blower-dryers. A single tank holds 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 of the presence of a dish rack. The rack is then sent through the rinse compartment, where it is sprayed with 180°F water by spray nozzles above and below the rack. Rack conveyor machines with multiple tanks differ in that some use stationary vs. rotating spray arms. The racks are then 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) make conveyors more water-, energy- and cost-effective.

Flight

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-dryer.

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 can translate 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 operational 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.
- Run rack machines only if they are full.
- Try to fill each rack to maximum capacity.

Quick Tip

Pre-rinsing dishes by hand before loading the dishwasher can use up to 20 gallons of water. Simply scrape food off dishes and load. ENERGY STAR qualified dishwashers and today's detergents are designed to do the cleaning so pre-rinsing can be eliminated. If dirty dishes are going to sit overnight, use the dishwasher's rinse feature that uses a fraction of the water and time used to hand rinse.

Mechanical Modifications

- Reuse rinse water to pre-rinse or wash dishes.
- Keep flow rates as close as possible to manufacturer's specifications.
- Install advanced rinse nozzles.
- 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 loss of water due to evaporation.
- Check volumes of service and estimate facility needs. A better option may be a larger machine that has a lower water flow per rack rate.

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 @ 80 psi. 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. There have been many adjustments and technology advancements in faucet design as a variety of low-flow faucet types are being 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.

CASE STUDY

Adopting Water Efficiency Practices

The Angus Barn restaurant in Raleigh reduced daily water usage by more than 10,000 gallons by installing new water efficient equipment and adopting water efficiency practices. New dishwashers, with a significantly shorter wash cycle that still meets performance and sanitation standards, were installed. An older water-cooled ice machine was replaced with an air-cooled ice machine. A variety of low-flow restroom fixtures including faucets, automatic flush urinals and toilets that meet performance expectations were installed. Changing from hosing kitchen floors every night to mopping floors on alternate nights and hosing the floor in between decreased water usage. Sanitation was not compromised with any of these water-efficient techniques.

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

Known as high-efficiency sprayers, these inexpensive nozzles use less water and can save a commercial kitchen hundreds of dollars a year in energy costs alone. The sprayers can also cut the water bill.

Pre-rinse sprayers are an essential component of kitchen operations. They are used to remove leftover grease and food off dishes, pots and pans before they go into a dishwasher. While conventional sprayers use between 2.5 and 4 gallons of water per minute, the high-efficiency sprayers use from 1.6 to 2.65 gpm.

The new generation of sprayers also comes with an automatic shut-off valve at the hose head, so water is supplied only when needed.

CASE STUDY

Foot-actuated Faucet

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.

Ice 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.

Ice Machine Water Use

Equipment	Type	Building Type	Water Use			Savings Potential	Comments
			Traditional	Existing Standard	High Efficiency		
Commercial	Ice-making head and remote condensing units	Operations requiring large volumes of ice	Water cooled units can use 150 gal/100 lbs. of ice	None	Air cooled units can use 25 gal/100 lbs. of ice	125 gal/100 lbs. of ice	Typically larger volume applications where ice-making head and storage bin are separate or ice-making head and condenser units are separated
	Self-contained	Most common configuration for low volume applications	Water cooled units can use 150 gal/100 lbs. of ice	None	Air cooled units can use 30 gal/100 lbs. of ice	120 gal/100 lbs. of ice	Free-standing units where ice-making unit and storage compartment are housed together in a single cabinet

Water-cooled machines use 10 times as much water as air-cooled machines and water rarely is recirculated. In comparing water- and air-cooled compressors, the compressor horsepower at design conditions is invariably higher with air-cooled machines. 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.

N.C. Division of Pollution Prevention and Environmental Assistance
Pollution Prevention Pays

The North Carolina Division of Pollution Prevention and Environmental Assistance provides free, non-regulatory technical assistance and education on methods to eliminate, reduce, or recycle wastes before they become pollutants or require disposal. Telephone DPPEA at (919) 715-6500 or (800) 763-0136 for assistance with issues in this fact sheet or any of your waste reduction concerns.

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