4.10 Commercial Dishwashers

EPA WaterSense

Overview

Commercial dishwashers are one of the largest water users in commercial kitchens. They clean and sanitize plates, glasses, bowls, utensils, and other food service ware. These machines can account for more than one-third of the overall water use in a commercial kitchen.[58] Commercial dishwasher design can vary greatly by application, depending on the how many employees, visitors, and/or customers are served by the commercial kitchen (i.e., the amount of facility throughput).

The most efficient commercial dishwashers reuse water from one wash load to the next, using one or more holding tanks. This not only reduces water use, but also reduces the amount of energy required to heat additional water. Alternatively, fill-and-dump commercial dishwashers discard water after each load, making this type of commercial dishwasher inherently less efficient.

Stationary hood-type dishwasher

The basic design of commercial dishwashers varies. Commercial dishwasher design can be separated into several categories:

- Undercounter
- Stationary door- or hood-type
- Conveyor-type
- Flight-type

Smaller facilities serving fewer than 60 people per day often use undercounter dishwashers, which are similar to residential dishwashers and tend to be smaller in size.

Stationary door- or hood-type commercial dishwashers are used for slightly larger throughputs of 150 people per day. These are usually manually front-loaded with racks (generally 20 inches by 20 inches in size) that contain dishes and other kitchenware.

Conveyor-type machines also wash dishes that are manually loaded on removable racks; however, multiple racks can be washed at a time, and the racks are pulled through the washer using a conveyor to complete each cycle. The conveyor is typically turned off between loads. These types of machines are ideal for larger service facilities serving up to 300 people per day.

Flight-type machines are used in facilities with the highest throughputs. They also use a conveyor, but instead of loading racks full of dishes onto the conveyor, the conveyor itself serves as a rack, and dishes are loaded onto the pegs or fingers of the conveyor rack as it comes around. The conveyor is typically continuously moving as dishes are loaded, washed, and removed.[59]

[58] Alliance for Water Efficiency. Commercial Dishwashing Introduction. www.allianceforwaterefficiency.org/commercial_dishwash_intro.aspx?terms=commercial+dishwasher.

[59] Koeller and Company and H.W. (Bill) Hoffman & Associates, LLC. June 2010. *A Report on Potential Best Management Practices—Commercial Dishwashers*. Prepared for the California Urban Water Conservation Council. www.cuwcc.org/products/pbmp-reports.aspx.

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Rack conveyor-type dishwasher

There are no federal standards limiting the water or energy consumption of commercial dishwashers. The U.S. Environmental Protection Agency (EPA) and the U.S. Energy Department's (DOE's) ENERGY STAR® qualifies energy- and water-efficient commercial dishwashers,[60] including undercounter, stationary single-tank door-, and conveyor- (single- and multi-stage tank-) type machines.

ENERGY STAR specifies that commercial dishwashers demonstrate a maximum water consumption in gallons per rack in order to qualify for the ENERGY STAR. ENERGY STAR qualified commercial dishwashers can reduce both energy and water use by 25 percent.

Operation, Maintenance, and User Education

For optimal commercial dishwasher efficiency, consider the following:

- Only run dishwashers when they are full. Each dishwasher rack should be filled to maximum capacity.
- Educate staff to scrape dishes prior to loading the dishwasher.
- Replace any damaged dishwasher racks.
- Ensure that the final rinse pressure and water temperature are within the manufacturer's recommendations.
- Operate the dishwasher close to or at the minimum flow rate recommended by the manufacturer. Set the rinse cycle time to the manufacturer's minimum recommended setting and periodically verify that the machine continues to operate with that rinse cycle time.
- Turn off machines at night when not in use.
- Make sure that manual fill valves close completely after the wash tank is filled.
- Find and repair any leaks. Inspect valves and rinse nozzles for proper operation and repair worn nozzles.

For conveyor-type machines, these further steps can be taken to ensure optimal efficiency:

- Install and/or maintain wash curtains. Wash curtains are able to retain heat within the machine.
- Ensure the rinse bypass drain is properly adjusted so that the wash tank is adequately replenished during operation.

[60] U.S. Environmental Protection Agency (EPA) and U.S. Energy Department's (DOE's) ENERGY STAR. Commercial Dishwashers Key Product Criteria. www.energystar.gov/index.cfm?c=comm_dishwashers.pr_crit_comm_dishwashers.

- Operate conveyor-type machines in auto-mode. This will save energy by running the conveyor motor only when needed.

Retrofit Options

Efficient retrofit options are available for conveyor-type dishwasher units. When retrofitting an existing conveyor-type dishwasher, consider installing rack sensors that allow water flow only when dishes are present, saving water by initiating the cleaning cycle less frequently.

Replacement Options

When purchasing or leasing a new commercial dishwasher or replacing an existing commercial dishwasher, look for ENERGY STAR qualified models,[61] which save water, conserve energy, and reduce overall operating costs. For flight-type dishwashers, which do not qualify for the ENERGY STAR, choose equipment with a water use of less than 0.01 gallons per dish.[62] In addition, choose models that reuse rinse water, if possible, as opposed to traditional fill-and-dump machines.

Be sure to consider the typical kitchen throughput to select an appropriately sized commercial dishwasher. A commercial dishwasher that is larger than necessary will waste water if the machine is not loaded to capacity.

Savings Potential

ENERGY STAR qualified commercial dishwashers use 25 percent less water than conventional models, on average. Use ENERGY STAR's commercial kitchen equipment savings calculator[63] to estimate facility-specific water, energy, and cost savings for replacing an existing commercial dishwasher with an ENERGY STAR qualified model.

The Food Service Technology Center also has a life cycle and energy cost calculator,[64] which can be used to calculate the savings potential from replacing many types of commercial kitchen equipment, including commercial dishwashers.

Depending upon the type of machine, a range of water and energy savings can be achieved. To estimate facility-specific water savings and payback, the facility can also use the following information.

Current Water Use

To estimate the water use of a commercial dishwasher, identify the following information and use Equation 4-22:

- Water use per rack washed.
- Average estimate of racks washed per day.
- Days of facility operation per year.

[61] *Ibid.*
[62] Koeller and Company and H.W. (Bill) Hoffman & Associates, LLC, *op. cit.*
[63] EPA and DOE's ENERGY STAR. Savings Calculator for ENERGY STAR Qualified Commercial Kitchen Equipment. www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/commercial_kitchen_equipment_calculator.xls.
[64] Food Service Technology Center. Commercial Foodservice Equipment Lifecycle Cost Calculator. www.fishnick.com/saveenergy/tools/calculators/.

Equation 4-22. Water Use of Commercial Dishwasher (gallons per year)

= Water Use per Rack x Racks Washed per Day x Days of Facility Operation

Where:

- Water Use per Rack (gallons per rack)
- Racks Washed per Day (racks per day)
- Days of Facility Operation (days per year)

Water Use After Replacement

To estimate the water use after replacing an existing commercial dishwasher with an ENERGY STAR qualified commercial dishwasher, use Equation 4-22, substituting the water use per rack washed of the new machine. ENERGY STAR specifies maximum water consumption rates per rack for undercounter, stationary single-tank door-, single-tank conveyor-, and multiple-tank conveyor-type machines.[65]

Water Savings

To calculate water savings that can be achieved from replacing an existing commercial dishwasher, identify the following and use Equation 4-23:

- Current water use as calculated using Equation 4-22.
- Water use after retrofit as calculated using Equation 4-22.

Equation 4-23. Water Savings From Dishwasher Replacement (gallons per year)

= Current Water Use of Dishwasher – Water Use of Dishwasher After Replacement

Where:

- Current Water Use of Dishwasher (gallons per year)
- Water Use of Dishwasher After Replacement (gallons per year)

Payback

To calculate the simple payback from the water use associated with replacing an existing commercial dishwasher, consider the equipment and installation cost of the ENERGY STAR qualified commercial dishwasher, the water savings as calculated in Equation 4-23, and the facility-specific cost of water and wastewater.

ENERGY STAR qualified commercial dishwashers also use less energy due to lower idle energy rates and a reduction in the use of hot water. This energy savings will further reduce the payback period and increase replacement cost-effectiveness.

[65] EPA and DOE's ENERGY STAR. Commercial Dishwashers Key Product Criteria, *op. cit.*

Additional Resources

Alliance for Water Efficiency. Commercial Dishwashing Introduction. www.allianceforwaterefficiency.org/commercial_dishwash_intro.aspx?terms=commercial+dishwashers+introduction.

Consortium for Energy Efficiency, Inc. 2010. *High Efficiency Specifications for Commercial Dishwashers*. www.cee1.org/com/com-kit/com-kit-equip.php3.

East Bay Municipal Utility District. 2008. *WaterSmart Guidebook—A Water-Use Efficiency Plan Review Guide for New Businesses*. Pages FOOD12-14. www.ebmud.com/for-customers/conservation-rebates-and-services/commercial/watersmart-guidebook.

EPA and DOE's ENERGY STAR. Commercial Dishwashers. www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=COH.

Food Service Technology Center (FSTC). Commercial Foodservice Equipment Lifecycle Cost Calculators. www.fishnick.com/saveenergy/tools/calculators/.

FSTC. Dishwashing Machines. www.fishnick.com/savewater/appliances/dishmachines/.

Koeller and Company and H.W. (Bill) Hoffman & Associates, LLC. June 2010. *A Report on Potential Best Management Practices—Commercial Dishwashers*. Prepared for the California Urban Water Conservation Council. www.cuwcc.org/products/pbmp-reports.aspx.

North Carolina Division of Pollution Prevention and Environmental Assistance. May 2009. *Water Efficiency, Water Management Options, Kitchen and Food Preparation*. Pages 2-4. www.savewaternc.org/busresources.php.