

Commercial Dishwashers

Commercial dishwashers have applications in restaurants, cafeterias, hospitals, schools, casinos, penitentiaries, military bases, convention centers, hotels, large churches, and just about anywhere there are numerous meals to be served each day. ENERGY STAR® commercial dishwashers are on average 25% more energy efficient and 25% more water efficient than standard models. Energy Star® models include units that are high temperature, low temperature, under counter, single tank door type, single tank conveyor and/or multiple tank conveyor. Depending upon the commercial dishwasher you select, savings can average as much as \$850 annually on utility costs! In addition, an average of 52,000 gallons of water will be saved per year over standard models.

Energy and Water Use - Benchmarks

To make a quantitative assessment and subsequent justification basis for replacement of an existing commercial dishwasher or to pay some additional cost for the purchase of a higher efficient unit; the benchmarks for energy and water use must be known. The Energy Star Label has [defined minimum specifications](#) for these efficiency benchmarks according to the machine type and operating features. These include:

Machine Type	High Temp Efficiency Requirements*		Low Temp Efficiency Requirements*	
	Idle Energy Rate	Water Consumption	Idle Energy Rate	Water Consumption
Under Counter	≤0.90 kW	≤1.00 gal/rack	≤0.5 kW	≤1.70 gal/rack
Stationary Single Tank Door**	≤1.0 kW	≤0.950 gal/rack	≤0.6 kW	≤1.18 gal/rack
Single Tank Conveyor	≤2.0 kW	≤0.700 gal/rack	≤1.6 kW	≤0.790 gal/rack
Multiple Tank Conveyor	≤2.6 kW	≤0.540 gal/rack	≤2.0 kW	≤0.540 gal/rack

*Idle results should represent tank heater idle energy rate measured with door closed and rounded to 2 significant digits. Gallons per rack results should be rounded to 3 significant digits.

**Includes pot, pan, and utensil machines.

It is important to realize that these Energy Star benchmarks are set as a minimum requirement for compliance with the Energy Star Label; however, as manufacturers' make improvements, these requirements are indexed to a higher minimum efficiency level as proven technologies become practice. This result can be observed in the older machines that were qualified for Energy Star ten years ago when [compared to newer machines](#) just released for production today². Most manufacturers will exhibit values lower than the minimum thus offering higher cost savings for both energy and water usage. Notice in the table that energy

consumption for the high temperature idle energy rate (180°F hot water sanitizing) is significantly higher than the low temperature idle energy rate (potable water and chemical sanitizing method). In this case, the comparison of chemical cost versus energy cost for a given daily production throughput would be an evaluation criteria over the life cycle of the machine. Also, it is seen that water consumption per rack loading for high temp and low temp is about the same except for Under the Counter dishwashers. The higher production machines are represented by the conveyor feed and tank arrangements.

Energy Star versus Standard Efficiency Machines									
Dishwasher Type Lookup Table	Energy Star				Conventional				Lifetime
	Gal/Yr	Elec UEC	Gas UEC	Price	Gal/YR	Elec UEC	Gas UEC	Price	
Under Counter, Low Temp	45,900	830	377	\$5,800	52,650	830	432	\$4,800	10
Under Counter, High Temp	27,000	5,059	222	\$6,000	53,460	7,738	439	\$5,000	10
Door Type, Low Temp	118,944	455	976	\$8,500	186,480	455	1,531	\$6,500	15
Door Type, High Temp	95,760	11,897	786	\$9,000	145,152	17,093	1,191	\$6,900	15
Single Tank Conveyor, Low Temp	113,760	3,974	934	\$14,000	177,120	3,974	1,454	\$11,000	20
Single Tank Conveyor, High Temp	100,800	21,728	827	\$15,000	162,720	29,726	1,336	\$12,000	20
Multi Tank Conveyor, Low Temp	116,640	8,640	957	\$22,000	213,840	8,640	1,755	\$18,000	20
Multi Tank Conveyor, High Temp	116,640	25,636	957	\$24,000	237,600	37,885	1,950	\$20,000	20

The [above table](#) can be extended with more details for evaluating life cycle cost savings based upon efficiency and customer unit costs for energy and water use. There are 20 different models that are included in the example spreadsheet for [calculating life cycle savings](#). The [current initial cost](#) can be included as well from reference sources shown below:

Performance and Cost Evaluation

The [National Sanitation Foundation](#) (NSF) is an accredited, non-profit, third-party certification body that tests and certifies products to verify they meet public health and safety standards. Although there are many associations and agencies that test or compare [appliance efficiency standards](#), the EPA's Energy Star Labeling Program has designated the NSF International as the testing resource for commercial dishwashers. Manufacturers are required to use this third-party evaluator to perform tests and certify those product models that meet the Energy Star guidelines. In measuring water consumption and idle energy rate, this Energy Star Partner agrees to use the following test standards:

- **Water Consumption:** NSF/ANSI 3-2007 Standard, Commercial Warewashing Equipment

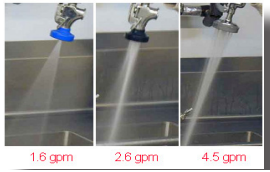
- **Idle Energy Rate for Hot Water and Chemical Sanitizing Undercounter and Stationary Rack Single Tank Door-Type Dishwashers:** ASTM Standard F1696, Standard Test Method for Energy Performance of Single-Rack Hot Water Sanitizing, Door-Type Commercial Dishwashing Machines.
- **Idle Energy Rate for Hot Water and Chemical Sanitizing Single and Multiple Tank Rack Conveyor Dishwashers:** ASTM Standard F1920, Standard Test Method for Energy Performance of Rack Conveyor, Hot Water Sanitizing, Commercial Dishwashing Machines.

The [cost](#) and [performance](#) of Energy Star-rated commercial dishwashers are related to features and production capacity.

Under Counter, High Temp			
Racks Washed Per Day	75	Racks	FSTC, 2007
			ENERGY STAR
Water Use per Rack	1	Gallons	Specification
Typical Wash Time	2.1	Min / Rack	FSTC, 2007
Annual Water Use	27,000	Gallons	Calculated
Idle Power Draw	0.42	kW	Assumption
Annual Building Water Heater Energy Consumption	222	Therm	Calculated
Annual Booster Heater Energy Consumption	2,734	kWh	Calculated
Annual Idle Energy Consumption	2,325	kWh	Calculated
Initial Cost per Unit	\$6,000		Industry Data 2007
Typical Product Lifetime	10	Yrs.	FSTC, 2007

Conservation Methods

Pre-Rinse Spray Valves



Pre-rinse spray valves are an integral part of many high-volume dishwashing stations. These devices are used to knock food particles off dirty dishes before running the dishes through the dishwashing machine. Most of

the valves on these sprayers are designed to spray water at anywhere from 2.5 gpm to 5.0 gpm. Over the course of the operating day, the water passing through these high-flow valves can really add up. The easiest way to save water and energy is to replace the high-flow pre-rinse spray valve with a low-flow unit, which is defined as 1.6 gpm or less. For instance, if the dishwasher is pre-rinsing dishes for three hours a day, a replaced 2.6 gpm valve with a 1.6 gpm valve, (a 1.0 gpm flow reduction), the daily water consumption will drop from about 470 gallons/day to 290 gallons/day saving about 66,000 gallons of water a year.

A properly designed low-flow spray valve hits your dirty plate with a higher velocity than the high-flow valve so the cleaning performance can be as good as or better than the high-flow units. This means water savings will not impact dish room productivity. The low-flow valves can be purchased at local restaurant supply stores and are easy to install. In fact, many water utilities offer incentives to replace high-flow valves and some water utilities even offer free low-flow valves.

In addition to water savings, you will also save energy because you are heating the water that sprays through these valves. Depending on the type of hot water heater and utility rates, there is often a savings as much on the energy bill as the water bill. One way to calculate energy and water savings is to use the [Pre-rinse Spray Valve Calculator](#), a simple online tool created by the Food Service Technology Center.

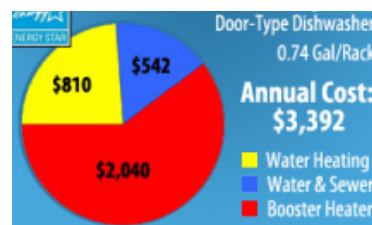
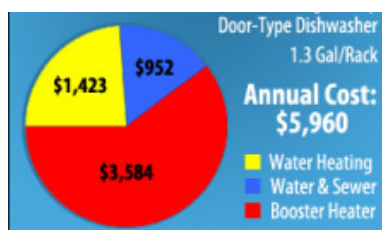
Operating Tips for Dishwashing Machines

Reference Source - [Fisher-Nickel, Inc.](#) is an engineering consulting firm specializing in energy efficiency in commercial kitchens.

- **Full Racks** - Make sure you only run full racks, which can save you hundreds of dollars annually.
- **Turn Off** - Turn dishwashing machines off at night. High-temp dishwashing machines often have internal tank heaters and could be wasting energy heating water you don't need. Turn off booster heaters and dishwashing machine exhaust hoods as well.
- **Rinse Pressure** - if the pressure gauge is reporting pressure above 25 psi you could be using more water than necessary. Most dishwashing machines require 20 psi.

- **Water Temperature** - Check water temperature and use manufacturer's guidelines for tank and rinse temp.
- **Auto Mode** - Make sure you operate conveyor dishwashing machines in auto mode, which saves electricity by running the conveyor motor only when needed.
- **Maintenance** - Add or maintain wash curtains- the plastic strips located on the ends of the conveyor dishwashing machine that are responsible for capturing the heat inside the machine.

Dishwashing machines are one of the most expensive pieces of equipment in the kitchen to operate. Purchase Energy Star models that use less water - one gallon or less of water per rack washed will save you significantly on water and electricity, as shown in the graphic below.



Commercial Dishwasher Definitions of Types / Features

A. Dishwashing Machine: A machine designed to clean and sanitize plates, glasses, cups, bowls, utensils, and trays by applying sprays of detergent solution (with or without blasting media granules) and a sanitizing final rinse.

B. Under Counter Dishwasher: A machine with an overall height 38 inches or less, in which a rack of dishes remains stationary within the machine while being subjected to sequential wash and rinse sprays, and is designed to be installed under food preparation workspaces. Under counter dishwashers can be either chemical or hot water sanitizing, with an internal booster heater for the latter. For purposes of this specification, only those machines designed for wash cycles of ten minutes or less can qualify for Energy Star.

C. Stationary Rack, Single Tank, Door Type Dishwasher: A machine in which a rack of dishes remains stationary within the machine while subjected to sequential wash and rinse sprays. This definition also applies to machines in which the rack revolves on an axis during the wash and rinse cycles. Subcategories of stationary door type machines include: single and multiple wash tank, double rack, pot, pan and utensil washers, chemical dump type and hooded wash compartment ("hood type"). Stationary rack, single tank, door type models are covered by this specification and can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.

D. Single Tank Conveyor Dishwasher: A ware washing machine that employs a conveyor or similar mechanism to carry dishes through a series of wash and rinse sprays within the machine. Specifically, 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. This type of machine may include a pre-washing section before the washing section. Single tank conveyor dishwashers can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.

E. Multiple Tank Conveyor Dishwasher: A conveyor type machine that has one or more tanks for wash water and one or more tanks for pumped rinse water, followed by a final sanitizing rinse. This type of machine may include one or more pre-washing sections before the washing section. Multiple tank conveyor dishwashers can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.

F. Hot Water Sanitizing (High Temp) Machine: A warewashing machine that applies potable hot water to the surfaces of wares to achieve sanitization.

G. Chemical Sanitizing (Low Temp) Machine: A warewashing machine that applies potable water and a chemical sanitizing solution to the surfaces of wares to achieve sanitization.

Advanced Technology

Dishwasher technology has improved dramatically over the last decade. New Energy Star qualified models include several innovations that reduce energy and water consumption and improve performance.

Soil sensors test how dirty dishes are throughout the wash and adjust the cycle to achieve optimum cleaning with minimum water and energy use.

Improved water filtration removes food soils from the wash water allowing efficient use of detergent and water throughout the cycle. The final clean-water rinse assures your dishes come out sparkling.

More efficient jets use less energy to spray detergent and water over the dishes when cleaning.

Innovative dish rack designs maximize cleaning by strategically situating the dishes.

About This Fact Sheet

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