



ENERGY STAR® Program Requirements

Product Specification for Commercial Dishwashers

Eligibility Criteria

DRAFT 1: Version 2.0

Following is the **Draft 1 Version 2.0** product specification for ENERGY STAR qualified commercial dishwashers. A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

1) Definitions: Below are the definitions of the relevant terms in this document.

- 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. Stationary Rack Machine: A warewashing 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.
 - a) Under Counter Dishwasher: A machine with an overall height 38 inches or less, 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.
 - b) Single Tank, Door Type Dishwasher: 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 can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.
- C. Conveyor Machine: A warewashing machine that employs a conveyor or similar mechanism to carry dishes through a series of wash and rinse sprays within the machine.
 - a) Single Tank Conveyor Dishwasher: A conveyor type machine that includes a tank for wash water followed by a final sanitizing rinse. This type of machine does not have a pumped rinse tank but may include a pre-washing section ahead of the washing section and an auxiliary rinse section between the power rinse and final rinse sections. Single tank conveyor dishwashers can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.
 - b) Multiple Tank Conveyor Dishwasher: A conveyor type machine that includes 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 a pre-washing section before the washing section and an auxiliary rinse section between the power rinse and final rinse section. Multiple tank conveyor dishwashers can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.
- D. Hot Water Sanitizing (High Temp) Machine: A warewashing machine that applies hot water to the surfaces of dishes to achieve sanitization.
- E. Chemical Sanitizing (Low Temp) Machine: A warewashing machine that applies a chemical sanitizing solution, as defined in NSF/ANSI 170, to the surfaces of wares to achieve sanitization.
- F. Product Family: Variations of one model offered within a single product line with design differences limited to: finish/color; length of pre-wash section, and orientation (e.g., corner, straight through models). Individual models represented by a product family must have the same rinse

water and idle energy consumption.

Note: The definitions provided above have been revised slightly to align with the terms provided in the latest version of NSF/ANSI 170-2009: *Glossary of Food Equipment Terminology*. EPA has also restructured the section to first define stationary rack and conveyor designs and then sub-product types (i.e., under counter, door type, single tank conveyor, and multi-tank conveyor). Stakeholders are encouraged to comment on these definitions or suggest additions to this section to better clarify the scope of this specification.

2) Scope:

- A. **Included Products:** Products that meet the definition of a Commercial Dishwasher as specified herein are eligible for ENERGY STAR qualification, with the exception of products listed in Section 2.B. The following product types are eligible: under counter; stationary rack, single tank, door type; single tank conveyor; and multiple tank conveyor. Glasswashing machines; pot, pan, and utensil washing machines; and dual sanitizing machines are also eligible. Only those under counter machines designed for wash cycles of 10 minutes or less are eligible for ENERGY STAR.
- B. **Excluded Products:** Flight-type machines are not eligible for ENERGY STAR under this specification.

Note: Following recent revisions to the FDA Food Code, changes to the NSF/ANSI 3-2009 test standard are being made that will allow for a post sanitizing potable rinse. These machine types are excluded in the current Version 1.2 specification (Section 2B) due to their inability to qualify for NSF certification. EPA understands that the new test standard will require that rinse water consumption results include the sanitation rinse and any post sanitation rinse cycle(s). Therefore, EPA has removed this exclusion which would allow machines with a post sanitation rinse to qualify for ENERGY STAR as long as this water consumption is represented in the gallons per hour rating and meets current FDA and NSF sanitation requirements. Stakeholders are encouraged to provide comment on these new developments and the proposed change in scope.

Flight Type Machines

EPA believes there is significant energy and water saving potential that could be gained by including flight type (i.e., rackless) conveyors in this Version 2.0 specification. Several manufacturers have suggested that EPA use a “gallons per 100 dishes” calculation to evaluate rinse water consumption for this machine type. The concern with taking this approach to evaluate performance is that peg spacing and speed, both inputs that influence the “gallons per 100 dishes” calculation, could be manipulated to create a more favorable result and may not be representative of the settings used in the field. In order to provide a means of comparison among products, EPA is proposing to require standard peg spacing and the slowest conveyor speed that would represent a worst case scenario. Stakeholders are encouraged to provide a standard peg spacing and conveyor speed to EPA. EPA is also interested in learning more about the amount of energy consumed by flight type machines while idling and the amount of time spent in this mode to determine whether significant savings could also be gained in this mode of operation.

3) Qualification Criteria:

A. Energy and Water Efficiency Requirements:

Table 1: ENERGY STAR Requirements for Commercial Dishwashers				
Machine Type	High Temp Efficiency Requirements		Low Temp Efficiency Requirements	
	Tank Heater Idle Energy Rate*	Water Consumption	Tank Heater Idle Energy Rate*	Water Consumption
Under Counter	≤ 0.51 kW	≤ 0.84 gal/rack	≤ 0.50 kW	≤ 1.19 gal/rack
Stationary Single Tank Door	≤ 0.70 kW	≤ 0.89 gal/rack	≤ 0.60 kW	≤ 1.00 gal/rack
Single Tank Conveyor	≤ 1.50 kW	≤ 0.700 gal/rack	≤ 1.50 kW	≤ 0.790 gal/rack
Multiple Tank Conveyor	≤ 1.92 kW	≤ 0.540 gal/rack	≤ 1.92 kW	≤ 0.540 gal/rack

* Idle results should represent tank heater idle energy rate measured with **door closed**.

Note: In determining the performance levels proposed in Table 1, above, EPA created a data set that includes currently qualified models listed on the ENERGY STAR website and non-qualified models listed in the NSF Certified Products Directory. Idle energy rate is not listed in the NSF Directory. For purposes of this Draft 1 analysis, EPA has assumed that these models are able to meet the existing Version 1.2 idle energy rate levels. Stakeholders are encouraged to share performance data on non-qualified machines for EPA consideration.

EPA believes that the Draft 1 levels provide the end user with several brand choices within each product category and a reasonable payback (i.e., less than 5 years).

Under Counter Machines

EPA is proposing reductions in water consumption and idle energy levels for high temp models that when combined represent the top 25% of EPA's data set. For low temp machines, ENERGY STAR data suggests that the existing 0.50 kW level continues to serve as a meaningful differentiator for those models that include a tank maintenance heater. Many of the models included in the data set do not include a maintenance heater and report an idle energy rate of zero. Therefore, EPA is only proposing a new level for water consumption, which represents the top 24% of the data set.

Door Type Machines

New water consumption and idle energy levels are proposed for high temp models that when combined represent the top 20% of EPA's data set. Similar to the under counter analysis, many of the low temp models included in the data set report an idle energy rate of zero and are assumed to be fill and dump designs. EPA believes there is potential for further reducing idle energy rate for door type machines. However, the current data set that includes idle energy is limited and EPA is seeking additional data. The revised water consumption level for low temp machines represents a reduction of 15% compared to the existing specification level.

Pot, pan and utensil machines were removed from this analysis due to their inherently higher water consumption. Since typical pot and pan machines use non-standardized racks (20 x 20), and in some cases house more than one rack per cycle, EPA normalized water consumption based on rack size.

Note cont.

Taking this approach did result in a few models being able to meet the existing ENERGY STAR requirements. However, EPA also recognizes that these machines represent a different application and are typically used in institutional settings. Based on the spread of the performance data, EPA believe there is a significant savings opportunity that might be realized by identifying the most efficient pot, pan and utensil designs. Stakeholders are encouraged to review the scatter plots posted on the ENERGY STAR website and provide feedback on whether separate performance requirements should be developed for these machine types.

Conveyor Machines

EPA understands that existing water consumption levels for both single and multi tank machines (low and high temp models) continue to be challenging to manufacturers and reducing them further could reduce cleaning performance. Therefore, EPA focused its analysis on adjusting idle energy levels to align high and low temp designs and further differentiate products to achieve additional savings.

The idle energy levels chosen for high temp single and multi tank high temp conveyors represent 26% and 13% of EPA's data set, respectively. EPA recognizes that the multi tank compliance rate is relatively low, due in part to the limited number of discrete data points, but also understands that there are several low cost options available to further reduce idle energy consumption, including tank insulation.

It's important to note that EPA's idle energy data sets for both single and multi tank low temp machines are extremely limited. Therefore, based on the assumption that for these categories both high and low temp machines typically use the same tank maintenance heaters, EPA is proposing to align these levels with the high temp proposed levels.

Stakeholders can view EPA's analysis at: www.energystar.gov/revisedspecs. EPA will also discuss the proposed new levels in greater detail during an ENERGY STAR stakeholder meeting on February 10, 2011 from 8 – 10 a.m. in Room S311 of the Orange County Convention Center. RSVPs can be sent to commercialdishwashers@energystar.gov.

- B. High/Low Temperature Machines: Machines designed to be interchangeable in the field from high temp to low temp, and vice versa, shall meet both the high temp and low temp requirements of Table 1 to qualify as ENERGY STAR.
- C. Calculations for Determining Gallons per Rack Results: The following calculations shall be used to determine gallons per rack. These calculations are based on gallons per rack conversions provided in the NSF Products and Service Listing for commercial dishwashers at www.nsf.org.

Conveyor Type

$$\text{GPR} = \frac{\text{GPH} \times \text{RL}}{\text{CS} \times 60}$$

Door Type

$$\text{GPR} = \frac{\text{GPH} \times (\text{WT} + \text{RT} + \text{DT} + \text{LT})}{3600}$$

Load Time= 5 seconds for straight through door-type dishwashers.

Load Time= 7 seconds for corner door-type dishwashers.

Load Time= 30 seconds for front load/unload dishwashers

Undercounter Type

$$\text{GPR} = \frac{\text{GPH} \times (\text{WT} + \text{RT} + \text{DT} + \text{LT})}{3600}$$

Load time= 30 seconds for undercounter dishwashers.

WT= Wash Time in seconds.

RT= Rinse time in seconds.

DT= Dwell time in seconds.

RL= Rack length, use 20x20 in.

LT= Load time.

CS= Maximum conveyor speed in feet per minute

GPH= Water use in gallons per hour.

D. Significant Digits and Rounding:

- a. All calculations shall be carried out with actual measured or observed values. Only the final result of a calculation shall be rounded. Calculated results shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.
- b. Unless otherwise specified, compliance with specification limit shall be evaluated using exact values without any benefit from rounding.

4) **Test Requirements:**

- A. Representative Models shall be selected for testing per the following requirements:
 - a. For qualification of an individual product model, the representative model shall be equivalent to that which is intended to be marketed and labeled as ENERGY STAR.
 - b. For qualification of a product family, any model within that product family can be tested and serve as the representative model.
- B. When testing commercial dishwashers, the following test methods shall be used to determine ENERGY STAR qualification:

Table 2: Test Methods for ENERGY STAR Qualification	
ENERGY STAR Requirement	Test Method Reference
Gallons per Rack (GPR)	NSF/ANSI 3-2009 Standard, <i>Commercial Warewashing Equipment</i>
Idle Energy Rate – Undercounter and Stationary Rack, Single Tank, Door Type	ASTM Standard F1696-07, <i>Standard Test Method for Energy Performance of Single-Rack Hot Water Sanitizing, Door-Type Commercial Dishwashing Machines*</i>
Idle Energy Rate – Single and Multiple Tank Rack Conveyor Dishwashers	ASTM Standard F1920-07, <i>Standard Test Method for Energy Performance of Rack Conveyor, Hot Water Sanitizing, Commercial Dishwashing Machines*</i>

* Although the titles of the ASTM test procedures listed above specifically call out hot water sanitizing machines, the idle energy rate portion is also applicable, and shall be used, for chemical sanitizing machines.

Note: It is EPA's intent that the ENERGY STAR specification reference the most recent test standards available for purposes of testing and qualification, As such, the latest version NSF/ANSI 3-2009, scheduled to be finalized and released over the next several weeks, is referenced above. Under this Version 2.0 specification, products will be required to be third-party certified to NSF/ANSI 3-2009 in order to qualify for ENERGY STAR.

- 5) **Effective Date:** The ENERGY STAR Commercial Dishwasher Specification shall take effect on **February 1, 2012**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on the model's date of manufacture. The date of manufacture is specific to each unit and is the date (e.g., month and year) on which a unit is considered to be completely assembled.

Note: EPA intends to finalize the Version 2.0 specification by May 2011 and allow manufacturers 9 months to transition to the new specification. As such, a February 2012 effective date is proposed above.

- 6) Future Specification Revisions:** EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions. In the event of a specification revision, please note that the ENERGY STAR qualification is not automatically granted for the life of a product model.

ASTM Test Standard Review: EPA plans to revisit this specification once the revision processes for ASTM F1696 and ASTM F1920 are complete. These test methods will address washing energy performance as well as idle energy rate.

Note: It continues to be EPA's intention to evaluate the final ASTM F1696 and F1920 test standards, and any available product performance data, to determine whether to extend testing and performance requirements to washing energy performance. Based on discussions with members of the F26 ASTM Standards Committee, EPA expects the F1920 standard for conveyor machines to be finalized in the first quarter 2011. Following the release of F1920, the F26 Committee will begin revising the F1696 test standard for door type machines.

Once the test standards are finalized, EPA will work with manufacturers to review the test methods and analyze performance data to determine if a specification could be developed to address washing energy performance, further differentiating products and offering additional savings to the end user.