



# ENERGY STAR® Program Requirements Product Specification for Commercial Dishwashers

## Eligibility Criteria Final Draft: Version 2.0

Following is the **Final Draft 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**<sup>1</sup>: Below are the definitions of the relevant terms in this document.

**Note:** Definitions for terms relevant to the Eligibility Criteria have been pulled from the Final Draft Test Method and will continue to live in this document. Terms specific to test conditions and methods will be retained in the Test Method document.

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

### Machine Types

- B. Stationary Rack Machine: A dishwashing 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: A stationary rack machine with an overall height of 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 or external booster heater for the latter.
- b) Single Tank, Door Type: A stationary rack machine designed to accept a standard 20 inch x 20 inch dish rack which requires the raising of a door to place the rack into the wash/rinse chamber. Closing of the door typically initiates the wash cycle. Subcategories of single tank, stationary door type machines include: single rack, double rack, pot, pan and utensil washers, chemical dump type and hooded wash compartment (“hood type”). Single tank, door type models can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.
- c) Pot, Pan, and Utensil: A stationary rack, door type machine designed to clean and sanitize pots, pans, and kitchen utensils.
- d) Glasswashing: A stationary rack, under counter machine specifically designed to clean and sanitize glasses.
- C. Conveyor Machine: A dishwashing 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: A conveyor machine that includes a tank for wash water followed by a sanitizing rinse (pumped or fresh water). This type of machine does not have a pumped rinse tank. This type of machine may include a prewashing section ahead of the washing section and an auxiliary rinse section, for purposes of reusing the sanitizing rinse water, between the power rinse and sanitizing rinse sections. Single tank conveyor dishwashers

<sup>1</sup> Additional terms found throughout this document, and related to machine components and operation, are defined in NSF 170-2010.

can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.

- b) Multiple Tank Conveyor: 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 sanitizing rinse. This type of machine may include a pre-washing section before the washing section and an auxiliary rinse section, for purposes of reusing the sanitizing rinse water, between the power rinse and sanitizing rinse section. Multiple tank conveyor dishwashers can be either chemical or hot water sanitizing, with an internal or external booster heater for the latter.
- c) Flight Type Conveyor: A conveyor machine where the dishes are loaded directly on the conveyor rather than transported within a rack. This machine is also referred to as a rackless conveyor.

### **Sanitation Methods**

- D. Hot Water Sanitizing (High Temp) Machine: A machine that applies hot water to the surfaces of dishes to achieve sanitization.
- E. Chemical Sanitizing (Low Temp) Machine: A machine that applies a chemical sanitizing solution to the surfaces of dishes to achieve sanitization.
- F. Chemical Dump Type Machine: A low temp, stationary rack machine with a pumped recirculated sanitizing rinse.
- G. Dual Sanitizing Machine: A machine designed to operate as either a high temp or low temp machine.

### **Modes and Metrics**

- H. Wash Mode: The dishwasher is in wash mode when it is actively running a cycle and is spraying wash water (i.e., water that is neither part of the sanitizing rinse, post sanitizing rinse, nor the prewashing unit).
- I. Rinse Mode: The dishwasher is in rinse mode when it is at the end of the actively running cycle and is spraying hot water or chemical sanitizing rinse water or a post-sanitizing rinse. If there is a post-sanitizing rinse, it shall be included in rinse mode.
- J. Dwell Mode: The dishwasher is in dwell mode when it is actively running a cycle but is not in wash or rinse modes.
- K. Idle Mode: The dishwasher is in idle mode when it is not actively running but is still powered on and ready to wash dishes at the required temperature.
- L. Energy Saver Mode: A dishwasher is in energy saver mode if the dishwasher is manually converted or, after inactivity, the dishwasher automatically converts to a setting that consumes less energy than it does in idle mode (not all dishwashers have this feature).
- M. Idle Energy Rate: The rate of energy consumed by the dishwasher while “holding” or maintaining wash tank water at the thermostat(s) set point during the time period specified in ASTM Standards F1920 and F1696.

**Note:** According to the ENERGY STAR Test Method, energy saver mode is disabled during the idle test period. However, EPA recognizes the additional energy savings that could result from this capability and would like to identify models that offer an energy saver mode on the ENERGY STAR Qualified Product List. As such, the definition is being included above for purposes of reporting this feature to EPA. Also, EPA has removed the words “tank heater” from the idle energy rate definition above since the energy consumed by the controls, for example, is also captured in this measurement.

## Qualification Terms

- N. Product Family: Variations of one model offered within a single product line with design differences limited to: finish/color; length of pre-wash section, voltage, and orientation (e.g., corner, straight through models). Individual models represented by a product family must have the same sanitizing and post sanitizing rinse water and idle energy consumption.

### 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; single tank, door type; single tank conveyor; multiple tank conveyor and flight type machines. Glasswashing machines; pot, pan, and utensil 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. This Version 3.0 specification only covers electric models.
- B. Excluded Products: Dishwashers intended for use in residential or laboratory applications are not eligible for ENERGY STAR under this product specification. Steam, gas, and other non-electric models cannot qualify for ENERGY STAR under this Version 2.0.

**Note:** In the Final Draft ENERGY STAR Test Method, DOE added language that clarifies the conditions needed to test dishwashers with a steam coil tank or booster heater. However, EPA does not have enough data at this time to inform setting idle performance levels for dishwashers with a steam source. Similarly, EPA has limited idle data for gas models. Based on market research and stakeholder input electric models represent the largest market share and thus biggest savings opportunity. According to several manufacturers, current ENERGY STAR labeling is limited to electric options within a product line and efforts are made to ensure that only electric models are labeled and promoted as ENERGY STAR. Therefore, EPA has decided to focus on electric models only and exclude non-electric models from qualifying under this Version 2.0 specification. To the extent that a single specification sheet includes electric as well as gas and/or steam options, manufacturers will be expected to make clear that only the electric model qualifies. Similarly, EPA will indicate on the Qualified Product Information list that only electric models are eligible for ENERGY STAR. Initial input from stakeholders agrees with this approach but there is continued interest in their inclusion under the next version of the specification, which will address total energy consumption of the machine.

### 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	
	Idle Energy Rate*	Water Consumption**	Idle Energy Rate*	Water Consumption**
Under Counter	≤ 0.50 kW	≤ 0.86 GPR	≤ 0.50 kW	≤ 1.19 GPR
Stationary Single Tank Door	≤ 0.70 kW	≤ 0.89 GPR	≤ 0.60 kW	≤ 1.18 GPR
Pot, Pan, and Utensil	≤ 1.20 kW	≤ 0.58 GPSF	≤ 1.00 kW	≤ 0.58 GPSF
Single Tank Conveyor	≤ 1.50 kW	≤ 0.70 GPR	≤ 1.50 kW	≤ 0.790 GPR

<b>Multiple Tank Conveyor</b>	≤ 2.25 kW	≤ 0.54 GPR	≤ 2.00 kW	≤ 0.540 GPR
<b>Single Tank Flight Type</b>	Reported	GPH = 2.975x + 55.00	Reported	GPH = 2.975x + 55.00
<b>Multiple Tank Flight Type</b>	Reported	GPH = 4.96x + 17.00	Reported	GPH = 4.96x + 17.00

\* Idle results should be measured with the **door closed** and represent the total idle energy consumed by the machine including all tank heater(s) and controls. Booster heater (internal or external) energy consumption should not be part of this measurement unless it cannot be separately monitored per the ENERGY STAR Test Method referenced in Section 4, below.

\*\* GPR = gallons per rack; GPSF = gallons per square foot of rack; GPH = gallons per hour; x = sf of conveyor belt (i.e., W\*L) /min (max conveyor speed).

**Note:** In response to comments on the Draft 3 specification, and subsequent discussions with stakeholders during the ENERGY STAR webinar held in October 2011, EPA revisited several requirements within this Version 2.0 specification. EPA's rationale behind the decision to revise or retain proposed specification requirements is provided below.

**Flight Type Machines:** Subsequent flight type test data provided by manufacturers suggests that the addition of an auxiliary rinse does not necessarily result in an increase in total energy consumption. Therefore, the levels for flight type machines, as proposed in the previous Draft 3 document allowing both standard and auxiliary designs to qualify, remain unchanged in this Final Draft. EPA continues to believe that it is important to provide manufacturers with an incentive to offer the most water efficient models and provide end users a tool to identify and purchase water efficient flight type machines. Total energy consumption will be addressed, along with other machine types, in the next specification revision using the finalized ASTM test procedures.

**Single Tank Door Idle:** The idle energy level for high temp, stationary rack door type machines has been edited slightly from 0.64 to 0.70 to accommodate the best performing model in EPA's dataset with regard to water efficiency. Since most of the energy savings potential is attributed to the reduction in water consumption, EPA would like to highlight efforts by manufacturers that bring these water saving devices to the market through ENERGY STAR recognition.

**Varying Rack Sizes:** During the Draft 3 ENERGY STAR webinar, a stakeholder raised the concern that smaller undercounter machines will have an advantage in regards to water consumption due to the smaller surface area, as compared to standard 20 inch x 20 inch rack machines. When reviewing performance data made available in the NSF database, EPA found a limited number of smaller undercounter machines available, some of which do not meet the levels as proposed above. There was also some concern that as EPA continues to push down water levels, manufacturers may begin introducing smaller machines to meet the requirements. If this were to happen, it is EPA's hope that this Version 2.0 would encourage efficient designs. In the meantime, EPA has decided not to make changes to the undercounter levels in this Final Draft.

Similarly a suggestion was made that EPA apply a consistent metric across all dishwasher types for measuring water consumption that normalizes for rack size. Where feasible, EPA agrees with a more consistent approach which is why gallons per rack has been chosen for undercounter, door type, and rack conveyor machines that offer standardized rack sizes. EPA has taken a slightly different approach for PPU as there is no standardized rack size for this machine type. EPA will continue to track the market and once data is available addressing total energy consumption, we will determine if any changes in approach or metric are warranted.

**Chemical Dump Machine Testing:** Stakeholders noted that some manufacturers offer chemical dump machines that include tank heaters to maintain NSF temperatures between cycles, thus avoiding the need to run a complete cycle prior to the next cleaning event, which wastes water and energy. As such, EPA has re-instated the requirements that chemical dump type machines need to be tested for idle energy consumption.

**Pot /Pan/Utensil Idle Energy Rate:** EPA's limited idle energy data suggests that PPU machines inherently use more energy than standard door type machines. EPA proposed initial idle levels similar to standard door type designs and based on stakeholder comments, EPA has slightly revised the idle energy levels in this Final Draft. Consistent with EPA's approach for determining idle energy levels for other machine types when initially launching the Version 1.0 specification, EPA will revisit these levels once more data is received through the qualification process.

**Supplemental Devices:** EPA received broad stakeholder input that prescriptive requirements regarding supplemental devices, such as drain water tempering controls, should not be included in this specification. While EPA recognizes the impact that these devices may have on water consumption, these supplemental devices are not used during NSF/ANSI 3 testing and are often not sold with the labeled product but instead are installed in the field. As such, EPA has determined that they are out of scope for the Version 2.0 specification. EPA continues to be interested in ways in which end users can be educated on the possible energy impacts of additional devices and will work with partners to identify these opportunities.

- B. **User-Adjustable Conveyor Machines:** Conveyor machines that offer multiple speeds adjustable by the end user must meet the ENERGY STAR requirements using the maximum conveyor speed setting (i.e., NSF/ANSI 3 certified sanitation setting). Water consumption using the slowest conveyor speed shall be reported.

**Note:** EPA continues to believe that minimum water consumption should be tied to sanitation and therefore, machines that offer user-adjustable speeds will be evaluated for ENERGY STAR qualification at the maximum speed setting. However, EPA will also require the reporting of water consumption at the slowest speed to provide the end user information on the range of usage. As indicated in the ENERGY STAR Test Method, conveyors with variable speeds not adjustable by the end user will be tested at factory settings.

- C. **Dual Sanitizing Machines:** As defined in Section 1, these machines shall meet both the high temp and low temp requirements presented in Table 1, above, to qualify as ENERGY STAR.
- D. **Dual Purpose Door Type Machines:** Machines designed to be used either as a standard door type machine or a pot, pan, and utensil machine shall meet the performance requirements for both of those sub categories.
- E. **Post Sanitizing Machines:** Machines offering a post sanitizing rinse will be evaluated for ENERGY STAR qualification with the post sanitizing rinse turned on during testing. The final rinse water consumption will include both sanitizing and post sanitizing rinses.

**Note:** The ENERGY STAR Test Method requires that machines be tested with and without the post sanitizing rinse turned on. For purposes of ENERGY STAR qualification, EPA believes that the end user should be assured of ENERGY STAR water efficiency performance at the most consumptive setting, where feasible. Therefore, these machines will be evaluated for qualification with the post sanitizing setting enabled during testing.

- F. **Industry Standard Certifications:** All machines shall be certified to the NSF/ANSI 3-2010 Standard, *Commercial Warewashing Equipment*.
- G. **Significant Digits and Rounding:**
- All calculations shall be carried out with directly measured (unrounded) values.
  - Unless otherwise specified, compliance with specification limits shall be evaluated using directly measured or calculated values without any benefit from rounding.
  - Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the second decimal point.

**Note:** The rounding principle presented in 3F.c above has been changed slightly to use decimal points as opposed to significant digits.

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:

<b>Table 2: Test Methods for ENERGY STAR Qualification</b>	
<b>ENERGY STAR Requirement</b>	<b>Test Method Reference</b>
Idle Energy Rate, GPH, GPR, and GPSF (all machines)	<i>ENERGY STAR Test Method for Commercial Dishwashers (Rev. May-2012)</i>

**Note:** The Department of Energy (DOE) has finalized the ENERGY STAR Test Method for measuring commercial dishwasher idle energy and water consumption. This Test Method is referenced in Table 4, above, and previous references to the relevant ASTM test standards have been removed from this specification.

- 5) **Effective Date:** The ENERGY STAR Commercial Dishwasher Specification shall take effect on **February 1, 2013**. 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 on which a unit is considered to be completely assembled.

**Note:** EPA intends to finalize the Version 2.0 specification in **June 2012**. Upon its finalization, all machines covered by this specification that have been certified as meeting the Version 2.0 requirements by an EPA recognized Certification Body (CB) may qualify immediately. **Effective February 1, 2013**, all currently qualified units must meet the Version 2.0 requirements and be third party certified to remain on the ENERGY STAR Qualified Product List. Manufacturers of products that do not meet eligibility and certification requirements as of this date must cease using the ENERGY STAR mark to promote those models. Manufacturers with questions about the Third-party Certification program can visit [www.energystar.gov/3rdpartycert](http://www.energystar.gov/3rdpartycert) or email [verification@energystar.gov](mailto:verification@energystar.gov).

- 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 will revisit this specification once the revision processes for ASTM F1696 and ASTM F1920 are complete to evaluate new performance requirements that capture total machine energy consumption.

**Note:** DOE and EPA continue to be engaged in the development of the ASTM F1920 and F1696 standards. Once new versions of these test standards are finalized, which differ from the ENERGY STAR test method, EPA will reach out to manufacturers and other interested stakeholders for performance data based on the total machine energy performance metric. EPA anticipates launching this data collection effort by mid-2013.