ENERGY STAR® Draft 3 Version 2.0
Commercial Dishwasher Specification
Stakeholder Webinar
October 18, 2011
Agenda

- Overview of Key Draft 3 Revisions
- Review of stakeholder comments received
- Test Procedure Status Update
- Next Steps and Timeline
Section 1: Machine Type Definitions

• Single Tank Conveyor
  – Clarification regarding the presence of an auxiliary rinse tank
  – “….may include a prewashing section ahead of the washing section and an auxiliary rinse section, for purposes of reusing the final rinse water, between the power rinse and final rinse sections”

• Flight Type
  – Removal of “permanently installed, vertical pegs” to allow for flat belt designs
Comments Received

- Clarify that machines with air gap, pumped final rinse are single tank if all other criteria is met
  - Interested in getting feedback on need to provide this clarification

- Address under counter rack size similar to door type definition (i.e., “standard rack”)
  - As written, models that accept a 16x16 rack can meet even if substantially less efficient
  - Interested in getting feedback on need to provide specific rack dimensions
Section 1: Mode and Metric Definitions

- **Wash Mode**: Machine is actively running a cycle and is spraying wash water (i.e., water that is neither part of the final rinse nor the prewashing unit).
- **Rinse Mode**: Machine is at the end of the actively running cycle and is spraying final hot water or chemical sanitizing rinse water.
- **Dwell Mode**: For stationary rack type, machine is actively running a cycle but is not in wash or rinse modes.
- **Idle Mode**: Machine is not actively running a cycle but is still powered on.
- **Idle Energy Rate**: The rate of energy consumed by the dishwasher tank heater while “holding” or maintaining wash tank water at the thermostat(s) set point during the time period specified in ASTM Standards F1920-11 and F1696-07.
Comments Received

• Rinse mode definition should clarify that it is the sanitizing rinse rather than pumped rinse from a multiple tank machine
  – Use NSF/ANSI 170 definition

• DOE is in the process of updating definitions
Section 1: Product Family Definition

- Current definition does not address fuel type options offered (steam, gas, electric)
  - Existing definition: “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 final rinse water and idle energy consumption”

- There will be different test methods proposed by DOE for fuel types other than electric
Comments Received

- Each machine should be tested and qualified individually
- EPA should continue to allow representative model (worst case) testing
  - Worst case may not track between GPR and idle
- Options under consideration:
  - Test/certify each individual model, as currently written
  - Allow for worst case GPR and idle (two tests total)
  - Interested in stakeholder feedback on an appropriate approach
# Energy and Water Efficiency Requirements – Draft 3

<table>
<thead>
<tr>
<th></th>
<th>High Temp</th>
<th>Low Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Undercounter</strong></td>
<td>≤ 0.50 kW</td>
<td>≤ 0.86 GPR</td>
</tr>
<tr>
<td><strong>Single Tank Door</strong></td>
<td>≤ 0.64 kW</td>
<td>≤ 0.89 GPR</td>
</tr>
<tr>
<td><strong>Pot and Pan</strong></td>
<td>≤ 0.70 kW</td>
<td>≤ 0.58 GPSF</td>
</tr>
<tr>
<td><strong>Single Tank Conveyer</strong></td>
<td>≤ 1.50 kW</td>
<td>≤ 0.700 GPR</td>
</tr>
<tr>
<td><strong>Multi-tank Conveyer</strong></td>
<td>≤ 2.25 kW</td>
<td>≤ 0.540 GPR</td>
</tr>
<tr>
<td><strong>Single tank Flight</strong></td>
<td><strong>Reported</strong></td>
<td><strong>GPH=2.975x + 55.00</strong></td>
</tr>
<tr>
<td><strong>Multi-tank Flight</strong></td>
<td><strong>Reported</strong></td>
<td><strong>GPH=4.96x + 17.00</strong></td>
</tr>
</tbody>
</table>

*Green – Draft 3 changed levels*
*Purple – Draft 2 proposed levels*
*Red – Draft 1 proposed levels*
*Black – Levels from V1.2 specification*
Section 3: Revised Performance Levels

- New GPR level for HT under counter machines
  - 0.86 to 0.84, qualification rate = 26%

- New idle energy rate for HT multiple tank rack conveyors
  - 2.00 to 2.25 kW, qualification rate = 21%
HT Under Counter Graph

Undercounter Type
Water v Idle Graph (High Temp)

- Energy Star - High
- NSF - High
- V 2.0 ENERGY STAR Level
- V 1.2 ENERGY STAR Level

Water Consumption (GPR)

Idle Energy Use (kW)
Multi Tank Conveyor
Water vs Idle (High Temp)

Idle Energy Use (kW)

Water Consumption (GPR)

- Energy Star - High
- NSF - High
- Energy Star - Dual (High)
- V 2.0 ENERGY STAR Level
- V 1.2 ENERGY STAR Level
Comments Received

- Reducing idle for door type machines from 1.0 to 0.64 kW would exclude the most water efficient designs
  - Increase idle to 0.7 kW to include this model
  - EPA considering this change, recognizing that greater energy savings will be garnered through reduction of rinse water consumption
HT Door Type Graph

Single Tank Door Type
Water v Idle Graph (High Temp)

- Energy Star - High
- NSF - High
- Energy Star - Dual (High)
- NSF - Dual (High)

V 2.0 ENERGY STAR Level
V 1.2 ENERGY STAR Level

0.53 GPR
Comments Received

• Idle energy rate does not capture energy consumed by on-board booster heater
  – Test method will provide guidance on separate monitoring of booster
  – ASTM method intended to measure total idle (all tanks and controls) but not booster
  – For V2.0, EPA will continue to define idle energy rate without internal booster idle energy
Comments Received

- Apply a consistent “useable rack space” for all rack machines
- LT dump type machines should not be tested for idle energy
- LT dump type should be tested for idle energy
  - These machine types are run through several cycles to get tank wash water up to temp for operation
  - More efficient to maintain tank water during idle
  - EPA should not encourage removal of tank heaters to avoid idle testing
  - EPA is interested in stakeholder input on this issue
Section 3: GPH/GPR Calculations

- New, more detailed GPH, GPR, and GPSF calculations proposed in Draft 3
- **Comment Received:**
  - Formula for stationary rack GPR may be more complicated than necessary
  - Simplify as the weight of water for x number of cycles divided by 8.34 lbs/gal divided by x cycles
- DOE is continuing to revise calculations, which will be provided along with the draft test method
Calculating GPR at max speed fails to capture worst case scenario for water consumption
  - Suggestion: require max speed for qualification but also require reporting GPR at slowest speed
  - Suggestion: Calculate GPR based on slowest speed based on manufacturer recommended range OR choose a midpoint between the two

EPA inclined to take the first suggestion

How would manufacturers choose speed for variable speed machines?
Section 3: Flight Type Machines

- Flight type levels proposed based on conveyor type, belt area, and speed (W*L/min)
- Testing based on max speed, which is used for certification to NSF/ANSI 3
- Idle energy rate to be tested using ASTM F1920-11 method and reported to EPA
FT Single Tank Graph

Single Tank
GPH vs. Conveyor Area Speed

GPH

sf/min

Single Tank
Dual Rinse
Older Machines
Draft 3 Single Tank Level

y = 2.975x + 55.00
FT Multiple Tank Graph

Multi Tank
GPH vs. Conveyor Area Speed

GPH

sf/min

Multi Tank
Dual Rinse
Older Machines
Draft 3 Multi Tank Level

4.96 x 17.00
Comments Received

• Support for including flight types as proposed
  – Opportunity for significant savings in short term
  – Continue to pursue total energy metric longer term
• Do not include prescriptive requirements, such as heat recovery
• Lingering concerns regarding dual rinse machines using more total energy than single rinse designs
  – Recommendation to create two categories
  – EPA not inclined to do as these machines compete in marketplace and data sets would be too small
FT Dual Rinse Discussion

- Reached out to several manufacturers of dual rinse machines
  - One instance where auxiliary tank heater rating was significantly higher than other designs
    - Led to slightly greater energy consumption
  - Additional testing suggests that it's possible to design a dual rinse machine that uses the same or less total energy than single rinse models
    - Reduction in booster heater significant, savings garnered at equipment and building levels

- Draft 3 levels were relaxed to allow more single rinse to meet, offering end user choices
Section 3: Certification to NSF 3

• Reference to NSF/ANSI 3-2010 has been removed from test procedure reference table
• Cleaning and sanitation performance is not measured for ENERGY STAR qualification
  — However, it’s important that final rinse water GPH is tied to cleaning and sanitation performance
• Therefore, new Section 3.E requires certification to NSF/ANSI 3 for ENERGY STAR qualification
Other Outstanding Issues

- EPA received limited idle data for pot, pan, utensil (PPU) machines
  - EPA may consider requiring idle energy reporting
- Comments on supplemental devices
  - OEM has no control, do not address in specification
  - Include water consumed for drain water tempering in GPH measurement (adjust test method)
  - If prewash temp control or drain water tempering device is shipped with machine then unable to use ENERGY STAR mark
  - Educate end users that use may impact performance
  - EPA inclined to take the education approach
Test Method Validation

Background

- DOE is responsible for validating and developing test methods for ENERGY STAR.
- ENERGY STAR Commercial Dishwasher Version 2.0 Draft 3 specification references two ASTM standards\(^1\)\(^,\)\(^2\) for the idle energy test.
- No method had been published for the final rinse water consumption test, so ENERGY STAR released a draft test method with Draft 2 of the Version 2.0 specification.

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Test Method Validation
Preliminary Testing Summary

• DOE conducted validation testing on 8 dishwashers.
  – Dishwashers chosen to represent a wide range of product types and features.
  – Initial testing has been completed.
  – Repeatability testing to determine consistency of results is underway.

• Testing allowed DOE to identify areas in each referenced test procedure that may need clarification.

• When published, the draft test method will provide a step-by-step, stand-alone test procedure.
  – Clearly identifies which steps of the referenced test procedures are needed and provides additional detail and clarifications, when necessary.
  – Scheduled for release in November 2011.
  – Stakeholder feedback will be solicited and the test method will be revised after all comments and data received are considered.
Test Method Validation
ASTM Test Procedures

• Overview of DOE’s proposed changes to the draft test method:
  – DOE plans to use the latest version of the ASTM test procedures.
  – Updates to idle energy test in the preliminary draft include:
    ➢ Max energy input rate test
      – Test based on specific power ratings of machine;
      – No water temperature specified to allow for variations in machine operation;
      – Instantaneous power measurement for electric heaters once heaters cycle on; and
      – Average power consumption for the last 3 minutes of 5 minute testing period for gas heaters.
    ➢ More details for steam and gas procedures
      – Once the detailed method is available, DOE strongly encourages feedback, especially for the steam test procedure.
    ➢ Internal booster heaters separately monitored and subtracted out for idle energy test
Overview of DOE’s proposed changes to the draft test method:
- Same basic procedure as originally published with more details added for clarity.
- Catch and weigh method that was originally published is easier than using a flow meter. DOE plans to specify method that should be used to improve repeatability.

Calculations in the preliminary draft have been revised since they were published in the Version 2.0 Draft 3 specification.
- Listed in detail so there is no ambiguity.
## Test Method Validation
### Preliminary Issues and Proposed Solutions

<table>
<thead>
<tr>
<th>Preliminary Issue</th>
<th>Preliminary Proposed Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some dishwashers include an energy saver mode that converts the machine to a setting that uses less energy after idling for a certain period of time.</td>
<td>Disable the energy saver mode during testing to provide a fair comparison of idle energy.</td>
</tr>
<tr>
<td>If a prewash maintenance heater is included, it may provide a different idle energy rate than units without a prewash heater.</td>
<td>Separate testing of machines that include prewash maintenance heaters.</td>
</tr>
<tr>
<td>There is no existing test method for measuring water consumption from a post-sanitizing rinse; machines with a post-sanitizing rinse were not included in validation testing.</td>
<td>Solicit stakeholder feedback on a test method for measuring water consumption for post-sanitizing rinse machines.</td>
</tr>
</tbody>
</table>
## Preliminary Issues and Proposed Solutions

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<td>Some machines include variable settings.</td>
<td>Require that the dishwashers be tested at the same specified settings (water levels, cycle times, sanitizing modes, etc.) for both the water consumption and idle energy tests.</td>
</tr>
</tbody>
</table>
Section 5: Effective Date

- EPA plans to finalize V2.0 requirements by end of 2011
  - Proposed new effective date of September 1, 2012
- Once released, all dishwashers meeting Version 2.0 requirements can be immediately begin getting certified to the new requirements.
  - Including equipment previously excluded under V1.1
Comments Received

• Concern about requirement that all models be third party tested to remain qualified under V2.0
  – Models qualifying under V1.1 are eligible for V2.0 certification without additional testing if:
    ➢ Model was tested by an EPA recognized 3rd party lab or 1st party lab in supervised/witness program
    ➢ Changes in test method do not impact performance results as compared to previous version
  – Data acceptance decision up to the EPA recognized Certification Body
Next Steps/Timeline

- ENERGY STAR Draft Test Procedure scheduled for release by November
- Final Draft V2.0 released in December
  - Specification levels will be finalized
- Specification becomes effective Sept 1, 2012
  - Products can immediately be certified to V2.0 once final
  - Summer 2012, EPA will cease to accept products certified to V1.1
  - Once effective, only those products that are certified to V2.0 will remain on the QP list
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LT MT Conveyor Graph

Multi Tank Conveyor
Water vs Idle (Low Temp)

- Energy Star - Low
- NSF - Low
- Energy Star - Dual (Low)

Water Consumption (GPH)

Idle Energy Use (kW)
LT Undercounter Graph

Undercounter Type
Water vs Idle Graph (Low Temp)

- Energy Star - Low
- NS\(^2\) - Low
- V 2.0 ENERGY STAR Level
- V 1.2 ENERGY STAR Level

Water Consumption (GPH) vs Idle Energy Use (kW)
HT ST Conveyor Graph

Single Tank Conveyor Water vs Idle Graph (High Temp)

- Energy Star - High
- NSF - High
- Energy Star - Dual (High)

New Level
Current Level

Water Consumption (GPH)

Idle Energy Use (kW)
LT ST Conveyor Graph

Single Tank Conveyor
Water v Idle Graph (Low Temp)

- Energy Star - Low
- NSF - Low
- Energy Star Dual (Low)
- NSF - Dual (Low)
- New Level
- Current Level

Water Consumption (GPA)

Idle Energy Use (kW)
HT STDT Graph

Single Tank Door Type
Water vs Idle Graph (High Temp)

- Energy Star - High
- NSF - High
- Energy Star - Dual (High)
- V 2.0 ENERGY STAR Level
- V 1.2 ENERGY STAR Level
PPU (Dedicated) GPSF Graph

Pot, Pan, Utensil Dedicated Systems
Water Consumption in GPSF

- NSF High Pot, Pan, Utensil
Updated Definitions

- **Wash Mode**: For stationary rack machines, the dishwasher is in wash mode when the machine is actively running a cycle and is spraying wash water (water that is neither part of the final sanitizing rinse nor the prewashing unit).

- **Rinse Mode**: For stationary rack machines, the dishwasher is in rinse mode when the machine is at the end of the actively running cycle and is spraying final hot water or chemical sanitizing rinse water.

- **Dwell Mode**: For stationary rack machines, the machine is in dwell mode when the machine is actively running a cycle but is not in wash mode or rinse mode.

- **Idle Mode**: A dishwasher is in idle mode when it is not actively running but is still powered on.

- **Energy Saver Mode**: A dishwasher is in energy saver mode if, after inactivity, the dishwasher converts to a setting that consumes less energy than it does in idle mode (not all dishwashers include this feature).

- **Idle Energy Rate**: The rate of energy consumed by the dishwasher tank heater while “holding” or maintaining wash tank heater at the thermostat(s) set point during the timer period specified in ASTM Standards F1920-11 and F1696-07.