ENERGY STAR Commercial Dishwashers

Version 3.0 Draft 2

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October 22, 2019
HAPPY ENERGY STAR DAY!
Call in Number

PGI Call-in:

1-877-423-6338

797501#
Agenda

- Welcome, Introductions
- Definition and Scope Changes
- Proposed Requirements
  - Notes on Dataset
  - Water Consumption
  - Washing Energy
- Energy Recovery Credit
- Data Collection for Future Revisions
- Comment Deadline
Heater Definitions

- Booster Heater (clarified)
- Storage
- Circulating water heater
- Instantaneous water heater
  - Tank type
  - Watertube type

- Added per stakeholder feedback
- Definitions from NSF 170-2015
Heat Recovery Machine Definition

Equipment with heat recovery equipment

- Technology Neutral.
- Options include: vapor, exhaust, drain, heat pump, other

To claim heat recovery credit:

- High temp:
  - ≥40 °F preheat capacity AND/OR,
  - Drainwater tempering avoidance (≤ 140 °F) AND/OR,
  - Ventless (Type II hood not needed).
- Low temp:
  - ≥40 °F preheat capacity
Scope Changes

• Removed Pot Pan Utensil Low Temp, High Temp Only
• Removed Flight Type Low Temp, High Temp Only
• Proposed in Version 3 Draft 1
• Lack of certified models and no product data
Dataset Updates

• Confidential wash data obtained from multiple stakeholders.

• **Multiple manufacturers** represented in additional data
  
  – Includes both Energy Recovery and conventional machines.

• Booster heater idle energy data received
Water Consumption

- **V3D1 Comments:**
  - Potential Rinseability Issues
  - Multiple stakeholders

- Reverted to Version 2.0 levels for all product types

<table>
<thead>
<tr>
<th>Machine Type</th>
<th>Low Temp Water Consumption*</th>
<th>High Temp Water Consumption**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Counter</td>
<td>≤ 1.19 GPR</td>
<td>≤ 0.86 GPR</td>
</tr>
<tr>
<td>Stationary Single Tank Door</td>
<td>≤ 1.18 GPR</td>
<td>≤ 0.89 GPR</td>
</tr>
<tr>
<td>Single Tank Conveyor</td>
<td>≤ 0.79 GPR</td>
<td>≤ 0.70 GPR</td>
</tr>
<tr>
<td>Multiple Tank Conveyor</td>
<td>≤ 0.54 GPR</td>
<td>≤ 0.54 GPR</td>
</tr>
<tr>
<td>Pot, Pan, and Utensil (PPU)</td>
<td>N/A</td>
<td>≤ 0.58 GPSF</td>
</tr>
<tr>
<td>Single Tank Flight Type</td>
<td>N/A</td>
<td>GPH ≤ 2.975x + 55.00</td>
</tr>
<tr>
<td>Multiple Tank Flight Type</td>
<td>N/A</td>
<td>GPH ≤ 4.96x + 17.00</td>
</tr>
</tbody>
</table>
Washing Energy

• Minor adjustments to High Temp Single Tank Conveyor

• New dataset confirmed V3D1 washing energy limits for other product types

• New Pot Pan Utensil Limit:
  – Terms of sq.ft./rack
  – Per stakeholder feedback

• Energy Recovery Credit applies to wash limit

<table>
<thead>
<tr>
<th>Machine Type</th>
<th>Low Temp Washing Energy</th>
<th>High Temp Washing Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Counter</td>
<td>≤ 0.15 kWh/rack</td>
<td>≤ 0.35 kWh/rack</td>
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<tr>
<td>Stationary Single Tank Door</td>
<td>≤ 0.15 kWh/rack</td>
<td>≤ 0.35 kWh/rack</td>
</tr>
<tr>
<td>Single Tank Conveyor</td>
<td>≤ 0.16 kWh/rack</td>
<td>≤ 0.36 kWh/rack</td>
</tr>
<tr>
<td>(was 0.34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple Tank Conveyor</td>
<td>≤ 0.22 kWh/rack</td>
<td>≤ 0.36 kWh/rack</td>
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<tr>
<td>Pot, Pan, and Utensil (PPU)</td>
<td>N/A</td>
<td>≤ 0.55 + 0.05 x SFrack</td>
</tr>
<tr>
<td>Single Tank Flight Type</td>
<td>N/A</td>
<td>Reported</td>
</tr>
<tr>
<td>Multiple Tank Flight Type</td>
<td>N/A</td>
<td>Reported</td>
</tr>
</tbody>
</table>
Energy Recovery Credit

\[ V \text{ [gal/rack]} \times 0.097 \text{ [kWh/gal]} \leq E_{\text{Credit\_max}}; \text{Machine Type} \]

- Requires at least ONE Energy Recovery feature:
  - 40 °F Preheat, ≤ 140 °F Drainwater, Ventless

- ASTM test must be performed at 70 °F ± 3 °F

- Credit based on:
  - 40 °F water preheat
  - Median water use
  - Stakeholder feedback

### Energy Recovery Credit Max,

\[ E_{\text{Credit\_max}} \]

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<tr>
<th>Machine Type</th>
<th>Credit Value (kWh/rack)</th>
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<td>0.07</td>
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<tr>
<td>Stationary Single Tank Door</td>
<td>0.07</td>
</tr>
<tr>
<td>Pot, Pan, and Utensil (PPU)</td>
<td>0.07 (kWh/Rack)</td>
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<tr>
<td>Single Tank Conveyor</td>
<td>0.06</td>
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<tr>
<td>Multiple Tank Conveyor</td>
<td>0.04</td>
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</tbody>
</table>

Additional data requested: PPU/Flight
Washing Energy by Product Type

Blue Line: V3D2 Wash Limit. Orange Line: Max ER Credit

- Rack Conveyor Single Tank No Energy Recovery
- Rack Conveyor Single Tank With Energy Recovery
- Stationary Door No Energy Recovery
- Stationary Door With Energy Recovery
Pot Pan Utensil, High Temp – Wash Requirement

V3D2 Proposed Wash Requirement, PPU

Wash Limit = 0.55 + 0.05 * sqft
Idle Energy Rate

- Proposed V3D1 Flight Type idle requirement dropped
  - Stakeholder comments that Flight machines have low idle hours
- No changes to other idle requirements

<table>
<thead>
<tr>
<th>Machine Type</th>
<th>Low Temp Idle Energy Rate*</th>
<th>High Temp Idle Energy Rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Counter</td>
<td>( \leq 0.25 \text{ kW} )</td>
<td>( \leq 0.30 \text{ kW} )</td>
</tr>
<tr>
<td>Stationary Single Tank Door</td>
<td>( \leq 0.30 \text{ kW} )</td>
<td>( \leq 0.55 \text{ kW} )</td>
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<tr>
<td>Single Tank Conveyor</td>
<td>( \leq 0.85 \text{ kW} )</td>
<td>( \leq 1.20 \text{ kW} )</td>
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<tr>
<td>Multiple Tank Conveyor</td>
<td>( \leq 1.00 \text{ kW} )</td>
<td>( \leq 1.85 \text{ kW} )</td>
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<tr>
<td>Pot, Pan, and Utensil (PPU)</td>
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<td>( \leq 0.90 \text{ kW} )</td>
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<tr>
<td>Single Tank Flight Type</td>
<td>N/A</td>
<td>Reported</td>
</tr>
<tr>
<td>Multiple Tank Flight Type</td>
<td>N/A</td>
<td>Reported</td>
</tr>
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</table>
Future Data Collection, ASTM: F1696 / F1920

- Primary Domestic Hot Water Energy
  - Information on hot water heater use (bldg. water heater)
  - Replaces the energy recovery credit in a future revision
  - Water Inlet Temperature (at test)

- Door Closed Idle Energy Rate, Energy Saver Mode
  - Evaluate whether to incorporate into program

- Booster Heater Idle Energy Rate
  - Incorporate the booster heater into ENERGY STAR idle performance criteria
  - Currently excluded from most idle measurement points (inseparable booster heaters rare in practice).
Additional Considerations for Future Revisions

• Test Procedure Updates:
  – NSF 3, rinseability test procedure
  – NSF 3, sanitization / water use updates
  – Updates to ASTM F1696 and F1920

• Additional Product Characteristics (QPX):
  – Dump and Fill Machine
  – (Flight Type) Single / Dual Rinse
  – Energy Recovery Information
    • Yes/No, Types of Energy Recovery used
Draft 2 Specification Comment Deadline

• Send written feedback to CommercialDishwashers@energystar.gov

• Please include any supporting data for additions or revisions to proposed requirements and/or adders with your written Draft 2 specification feedback.

<table>
<thead>
<tr>
<th>Comment Deadline</th>
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<tbody>
<tr>
<td>Thursday, November 7, 2019</td>
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Contact Information

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ASTM F26 Meeting – Oct. 29-30, 2019

- Brian Ward (ICF) attending in person
- Tanja Crk & Brian Krausz (EPA) calling in
Duty Cycles Discussion (CFS Savings Calculator)

- Assumptions from ~2009. Still representative of the market?

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<thead>
<tr>
<th>Machine Type (Low Temp)</th>
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<th>Average daily hours of operation</th>
<th>Racks washed per day</th>
<th>Typical wash time (min)</th>
<th>Time spent in wash mode per day (hrs)</th>
<th>Time spent in idle mode per day (hrs)</th>
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<tbody>
<tr>
<td>Under Counter</td>
<td>365</td>
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<td>75</td>
<td>2</td>
<td>2.5</td>
<td>15.5</td>
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<td>Stationary Single Tank Door</td>
<td>365</td>
<td>18</td>
<td>280</td>
<td>1.5</td>
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<td>11</td>
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<td>18</td>
<td>600</td>
<td>0.3</td>
<td>3</td>
<td>15</td>
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<tr>
<td>Pot, Pan, and Utensil</td>
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<td>600</td>
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<td>16</td>
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<td>Single Tank Flight Type</td>
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<td>18</td>
<td>N/A</td>
<td>0.2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Multiple Tank Flight Type</td>
<td>365</td>
<td>18</td>
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