CLEAN & GREEN

Kaustav Ghosh
Whirlpool Corporation

Acknowledgements:
Nick Gillespie
Syl Amos
Sean Southard
Mary Zeitler
Tony Hardaway
Corinne Gorenchan
Dave Scharich

WHIRLPOOL CORPORATION: Confidential
OUTLINE

• Overview of Whirlpool

• Driving Forces of Laundry Efficiency
  – Consumer
  – Company Specific Sustainability Outline
  – External Regulations

• Delivery of Water / Energy Efficiency in Laundry
  – Amount of Water / Energy Reduction over Time
  – Innovative Technologies and Features Driving Performance
  – Challenges During Water / Energy Reduction

• Thoughts on Future of ‘Green’ in Laundry
  – Beyond Direct Water and Energy Reduction
ABOUT WHIRLPOOL CORPORATION

- Leader of $110B Global Industry with $18B in Revenue
- #1 Global Brand
- Founded in 1911 – Over a Century of Success
- Manufactures products in 11 countries and markets products in nearly every country around the world
WHIRLPOOL CORPORATION’S U.S. COMMITMENT

$1B U.S. Investment

> 22,000 U.S. Employees

> $7.4B Annual Manufacturing Costs

> $2.3B Annual U.S. Supply Chain Purchases

$500M U.S.-Based R&D Investment
A SINGLE GOAL FOR OUR COMMON GLOBAL CONSUMER

Consumers expect clean
75% credited ENERGY STAR label as an important influence
72% of consumers report a company's environmental responsibility influences
SUSTAINABILITY AT WHIRLPOOL

MISSION

“To protect the environment, nurture our communities and embed sustainability into our products and processes while winning with the consumer, driving extraordinary value and enhancing our reputation”

STRATEGY

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>Corporate Office for Environmental Control</td>
</tr>
<tr>
<td>1975</td>
<td>Support craft Energy Policy and Conservation Act</td>
</tr>
<tr>
<td>1979</td>
<td>Support craft U.S. FTC Labeling and first appliance efficiency standard</td>
</tr>
<tr>
<td>1996</td>
<td>Helped Develop Green Lights with EPA, precursor to ENERGY STAR</td>
</tr>
<tr>
<td>2000</td>
<td>First Top Load HE washing machine</td>
</tr>
<tr>
<td>2003</td>
<td>First appliance manufacturer to announce GHG reduction target</td>
</tr>
<tr>
<td>2007</td>
<td>More stringent GHG reduction target up to 6.6% by 2012</td>
</tr>
<tr>
<td>2011</td>
<td>Partnered with AHAM, UL and CSA to develop first industry sustainability standard</td>
</tr>
</tbody>
</table>
**EXTERNAL REGULATIONS – WATER AND ENERGY EFFICIENCY CALCULATIONS**

- **Modified Energy Factor,**
  \[ \text{MEF} = \frac{C}{(E_{TE} + D_E)} \], where:
  - \( C \) = Drum capacity in Ft³
  - \( E_{TE} \) = Total Machine Energy /cycle in kWh, \( HE_T + ME_T \)
  - \( D_E \) = Dryer energy
  - \( HE_T \) = Hot Water energy
  - \( ME_T \) = Mechanical energy

- **Water Factor,**
  \[ \text{WF} = \frac{Qt}{C} \]
  - \( Qt \) = Total water used/cycle in Gallons
  - \( C \) = Drum capacity in Ft³

---

**Test Conditions for MEF and WF:**
- Controlled Hot water inlet at 120 F and cold water inlet at 60 F used
- Hot water volume for MEF (\( HE_T \)) and total water volume for WF (\( Qt \))
- RMC measured at end of wash to calculate Dryer energy (\( D_E \))

**MEF – Higher is Better**
**WF – Lower is Better**

WHIRLPOOL CORPORATION: Confidential
ENERGY STAR stipulates significant water and energy reduction compared to deep fill Top Load.

CEE suggests even higher water / energy efficiency.
THE PARADIGM SHIFT
We believe it is possible for Clean & Green.

BEING GREEN...
By meeting new regulatory standards for:
Lower energy
Lower water

...WHILE ACHIEVING CLEAN
Through new wash technologies & innovative detergent chemistry.
PRODUCTS – INNOVATIONS DELIGHTING MAINSTREAM CONSUMERS
Adverse Effects of Reducing Water Temperatures

• **Cautions/concerns:**
  
  – Lower cleaning of thermally sensitive stains e.g. body soil, grease
  
  – Dingy build-up in clothing due to reduced cleaning, redeposition of soils
Adverse Effects of Reducing Water Volume

- **Cautions/Concerns:**
  - Lower water volume suggests less fluid for soil transport
    - Risk of redeposition and dingy garments
    - Greater Detergent residue left on fabrics
    - Less removal of chunky / particulate soils
  - Dye transfer issues increase with concentration
  - Reduced Fabric Care Chemical Uniformity on Fabrics
Adverse Effects of Reducing Water Volume

HE – Spray Rinse

TL Deep Fill

Dye Transfer

Fabric Softener
Greater Wrinkle Generation
- Higher and longer spins
- Cooler water temperatures do not release wrinkles
- Low water in TL washers increase wrinkling

Dry Spots on Load
- Consumers associate with ineffective washing due to low water
Consumer Perception of Water Temperatures

- Cold - 45 - 55 F
- Cool - 55 – 65 F
- Warm - 75 - 95 F
- Hot - 96 - 120 F

Average TL HE Temperature Ranges

- Whirlpool has studied consumer’s perception of water temperatures
  - Less than 85F is no longer considered “warm”
  - Less than 110F is no longer considered “hot”
OUR CURRENT NORTH AMERICAN POTENTIAL

Water Savings by Whirlpool’s top 3 wash platforms in North America over 10 years from 2012 – 2022 is enough to supply Niagara Falls for 36 days.

Water Savings by Whirlpool’s top three washer platforms in North America over 10 years (2012 – 2022) – 2.45 T Gallons
Platform Energy Breakdown & Comparison

Energy (kWh/cycle)

- Total Energy
- Dryer Energy (DE)
- Hot Water Energy (HEt)
- Machine Energy (MEt)

Energy Category: 2004 Traditional TL - TL HE - Front Load

- 55% reduction in Total Energy
- 20% reduction in Dryer Energy (DE)
- 85% reduction in Hot Water Energy (HEt)
- 45% reduction in Machine Energy (MEt)

Bang for the Buck – Future Areas to Truly Impact Water and Energy Reduction
Alternate Ideas of Driving More Significant Water and Energy Impact - Replacement

Clothes washer
Annual Average kWh usage and cost $

Diminishing returns
Washer Replacement bigger benefit
OUR GLOBAL POTENTIAL
Leveraging existing innovations globally triples the savings we’ve achieved until now.

Global HE Washers Need HE Detergent Penetration in those Markets
Without HE Detergent Consumers will have Negative Experience
CLOSING STATEMENT
Invitation to work towards the future

Cooperation: Industry | Govt | Utilities | NGOs