LTDH Connected Appliances
Task 2.1.5

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Aim of deliverable

• Summarize available research on heat driven appliances and investigate the possibility of implementing them at the COOL DH test sites.
• Determine the potential electricity savings with heat driven appliances.
• Investigate appliances with hot and cold water connections as an alternative since heat driven appliances have not been commercialized.
Heat Driven Appliances

Dishwashers, washing machines and tumble dryers with integrated heat exchangers

Developed in research projects in 2004-2014
Asko Appliances Ltd – the company behind the development
Were never commercialized and there are no plans to resume the production
Required at least 55 °C and max 80 °C heating water circuit
System solutions

• **Separate circuit**
  – Originates from main substation.
  – High installation cost.
  – Not suitable in low energy buildings.

• **Secondary heating system – Västeråsmodellen**
  – Secondary distribution line between main substation and household.
  – Requires substation in each household.
Results from study

*Assuming an annual number of process cycles of 280 ** Assuming an annual number of process cycles of 220 *** Assuming an annual number of process cycles of 160

<table>
<thead>
<tr>
<th>Asko HWC appliance</th>
<th>Average electric energy usage per cycle (kWh)</th>
<th>Average electric energy usage per cycle at 55 °C heating water (kWh)</th>
<th>Average reduction of electric energy usage per cycle at 55 °C heating water (kWh) (%)</th>
<th>Annual average reduction of electric energy usage (kWh) at 55 °C heating water</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWC dishwasher</td>
<td>1</td>
<td>0.52</td>
<td>0.48 (48 %)</td>
<td>134.4*</td>
</tr>
<tr>
<td>HWC washing machine</td>
<td>0.72</td>
<td>0.28</td>
<td>0.43 (74 %)</td>
<td>95.6**</td>
</tr>
<tr>
<td>HWC tumble dryer</td>
<td>3.51</td>
<td>1.24</td>
<td>2.27 (65 %)</td>
<td>363.8***</td>
</tr>
<tr>
<td><strong>SUM:</strong></td>
<td><strong>5.23</strong></td>
<td><strong>2.04</strong></td>
<td><strong>3.18</strong></td>
<td><strong>593.8</strong></td>
</tr>
</tbody>
</table>

48 %
(0.48 kWh/cycle)

74 %
(0.43 kWh/cycle)

65 %
(2.27 kWh/cycle)

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Experiences from tests - Västerås

- Nearly 200 households with heat driven appliances.
- Dishwashers and washing machines are working great!
- Requests for new machines have had to be turned down.
Appliances with alternative tap water connections

**Dishwashers connected to hot water**

- Requires a machine design with heat resistant hoses.
- Manufacturers: Asko, Miele, Bosch.
- Electricity savings of around 35 % (0.3 kWh/cycle).

**Washing machines connected to hot and cold water**

- Requires a machine design with heat resistant hoses and two water connections.
- Only available as *professional* machines.
- Manufacturers: Asko, Miele, Podab.
- Electricity savings of 60-87 % (0.6-1.3 kWh/cycle)
Conclusions

• **Heatdriven appliances** would have been suitable at Brunnshög but not in Høje-Taastrup / Østerby.

• Regular **dishwashers** can be connected to hot tap water instead of cold tap water. Possible electricity substitution: Around 35 %.

• Some **professional washing machines** have two possible water intakes. Possible electricity substitution: 60-87 %.
Thank You!

Tack!

Tak!

Merci!