ORNL HVAC/WH Research Overview

Building America Quarterly Meeting
April 16, 2008
Analysis of DH Options
Evaluation of Near-Term DH Control Options

- BA Cities – Atlanta, Houston, Chicago
- BA Houses – 1800 sq.ft. RSP and ZEH 2-story
- TRNSYS analysis, DB and RH control
  - 76F DB, 55% RH set points
  - 15 min time steps
  - AC sizing based on DOE2.2 design loads
- Equipment
  - Conventional AC of 13 SEER
  - Available Enhanced DH Options
  - Near-Term Development Options
Evaluation of Near-Term DH Control Options -- Equipment--

- Available Enhanced DH Options
  - 20% Reduced Airflow when DH call
  - Standalone DH (1.3 EF) with Recycler Control
  - Carrier Thermidistat (overcooling RH control)
  - Lennox Humiditrol (subcooler reheat w overcool)

- Near-Term Development Options
  - Discharge gas reheat (packaged unit)
  - Modified discharge gas reheat (split unit with OD fan control)
## Relative Performance of Selected Enhanced Dehumidification Approaches

### Houston, RSP House

<table>
<thead>
<tr>
<th>DH Equipment</th>
<th>Hrs&gt;60% RH</th>
<th>Rel. kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional AC Unit Baseline</td>
<td>4090</td>
<td>100%</td>
</tr>
<tr>
<td>Conv. AC with 20% Reduced Airflow w DH call</td>
<td>3080</td>
<td>117%</td>
</tr>
<tr>
<td>Standalone DH with Fan Recycler</td>
<td>0</td>
<td>223%</td>
</tr>
<tr>
<td>Lennox Humiditrol</td>
<td>352</td>
<td>157%</td>
</tr>
<tr>
<td>Discharge Gas Reheat (pkg)</td>
<td>0</td>
<td>169%</td>
</tr>
<tr>
<td>Mod. Discharge Gas Reheat (split unit)</td>
<td>0</td>
<td>203%</td>
</tr>
</tbody>
</table>
### Relative Performance of Selected Enhanced Dehumidification Approaches

**Houston, ZEH Prototype**

<table>
<thead>
<tr>
<th>DH Equipment</th>
<th>Hrs&gt;60% RH</th>
<th>Rel. kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional AC Unit Baseline</td>
<td>4841</td>
<td>100%</td>
</tr>
<tr>
<td>Conv. AC with 20% Reduced Airflow w DH call</td>
<td>4191</td>
<td>111%</td>
</tr>
<tr>
<td>Standalone DH with Fan Recycler</td>
<td>0</td>
<td>203%</td>
</tr>
<tr>
<td>Lennox Humiditrol</td>
<td>244</td>
<td>153%</td>
</tr>
<tr>
<td>Discharge Gas Reheat (pkg)</td>
<td>1</td>
<td>168%</td>
</tr>
<tr>
<td>Mod. Discharge Gas Reheat (split unit)</td>
<td>0</td>
<td>203%</td>
</tr>
</tbody>
</table>
Conclusions

- **Current Options**
  - Lennox Humiditrol with overcooling
    - Best balance of RH control and energy use

- **Near-Term Options**
  - Condenser reheat for packaged equip
    - Best combo of RH control and energy use
  - Condenser reheat for split equipment
    - Needs further development to reduce energy use
ORNL Web-Based Dehumidifier Model

- Expansion of HPDM
- Fully Accessible Online from Browser
- Outside Ventilation Air and Return Air Mixing Options
- Operating and Design Parametrics (e.g. DB/RH ranges)

Web Version Available

http://www.ornl.gov/~wlj/hpdm/MarkVI_DH.shtml