Energy Efficient Water Heating – A Manufacturer’s Perspective

June 23, 2005
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Rheem Water Heaters
Topics of Discussion

- Overview of US Water Heater Market
- Regulatory Changes / Effect on the major tank type water heater manufacturers
- Trends
  - “Conventional” tank water heaters
  - Tankless water heaters
  - Solar Water Heaters
- Energy Star and Water Heaters
- How builders can help encourage high performance water heating
- Final Thoughts
- Questions
Overview of US Water Heater Market

- “Conventional” Water Heaters
  - Total US Market – 11 million units annually
    - 53% gas
    - 47% electric
  - Replacement vs. new construction
    - 9.2 million replacement units (84%)
    - 1.8 million new construction units (16%)
- Major US Water Heater Manufacturers
  - Rheem
  - AO Smith (includes State Industries)
  - Bradford White
  - American Water Heaters
Overview of US Water Heater Market

- **Tankless Gas Water Heaters**
  - US Market 2004:
    - 2004 US Market: 129,000 units
    - Industry up 57% through May 2005 (Storage water heater market flat at 1% annual growth)
  - Major tankless gas manufacturer’s that sell in the United States
    - Paloma (Rheem)
    - Rinnai
    - Takagi
    - Noritz
    - CEC/Bosch

Diagram: Pie chart showing 129,000 units of Tankless Gas Water Heaters and 11,000,000 units of Storage Type Residential Water Heaters.
Overview of US Water Heater Market

- Solar Water Heater Manufacturers
  - No accurate numbers of market size available. Best estimate from industry sources is 15,000 systems/year
  - 90%+ active systems, remainder passive
  - Virtually no new construction market outside of Hawaii
  - Solar storage tank and collector manufacturers

<table>
<thead>
<tr>
<th>Solar Storage Tanks</th>
<th>Solar Collectors *</th>
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<tr>
<td>Rheem</td>
<td>Solahart (Rheem)</td>
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<td>AO Smith / State</td>
<td>SunEarth</td>
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<tr>
<td>Bradford White</td>
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<td>American</td>
<td>Heliodyne</td>
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<td>Vaughn</td>
<td>Radco</td>
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* = Flat plate, glazed
Recent Regulatory Changes and their effect on the major water heater manufacturers

- **Flammable Vapor Ignition Resistance (FVIR)**
  - New safety technologies created by the Water Heater Consortium
  - Affects the majority of residential gas storage waters
  - Staggered rollout by product type. Began 7/1/2003 and will end 1/1/2007
  - Most significant changes to affect water heaters in over 50 years. Significant capital investment by all manufacturers

- **National Appliance Energy Conservation Act II (NAECA II)**
  - Affects all residential storage water heaters
  - Raised minimum Energy Factors (EF’s) 5 points on gas models and 4 points on electric models
  - Became effective 1/20/2004.
  - Significant capital investment by all manufacturers.

*Major Water Heater Manufacturers have recently been forced to focus on what we are mandated to develop as opposed to what we’d like to develop*
Trends – Storage Type Water Heaters

- **Current Trends**
  - More storage capacity, higher BTU’s
  - Low NOx burners
  - Powered Direct Vent / Sealed Combustion
  - Boiler w/indirect fired water heaters (geographically limited)
Trends – Storage Type Water Heaters

- **Future Trends**
  - Condensing gas
    - Thermal efficiencies of up to 96%
    - Standby losses of 1%
  - Combined systems
    - Domestic hot water and space heating in one application
  - Heat Pump Water Heaters
    - Poor consumer impression of reliability
    - Japanese technology major innovation drivers
Trends – Tankless Water Heaters

- **Product Trends**
  - Direct vent/sealed combustion
  - Higher BTU’s (200K+)
  - Condensing units w/higher thermal efficiencies
    - 95%+
    - High first cost
  - Combination units
Trends – Tankless Water Heating

**Application Trends**
- Zero Energy Homes (ZEH)
- Combination domestic water and space heating
- “Split” systems for new homes
- Solar “booster” applications
- D’mand type pump systems
Trends – Solar Water Heating

- Virtually no new construction activity outside of Hawaii involving SDHW
- Solar water heating still has a negative public perception
  - Sales of solar pool panels and PV arrays greatly exceed SDHW
  - First costs of solar thermal systems a deterrent – ironic!
- Most solar installations are replacements or retrofits
- Worldwide, solar is still an incentive driven product
- Million Solar Roofs Initiatives
Trends – Solar Water Heating

- “Active” Systems
  - 90+% of overall solar market
  - “Drain back design”: preferred system design for freeze protection
- Solar / tankless combinations – ideal for ZEH applications
- Polymer solar water heaters
  - Still in R&D
  - Reduction in manufacturing and first cost of systems
- Aesthetics

Solar / tankless Combination
Solar Drainback System
Energy Star and Water Heaters

- January 6, 2004: DOE decided not to establish Energy Star criteria for domestic water heaters
  - Incremental savings between best and worst performing conventional water heaters would not justify the awarding of Energy Star designation (differentiation narrowed due to 2004 NAECA revisions)
  - Purchasers of “non-conventional” products (ie – tankless, solar) would not recover their incremental investment within a reasonable time period (DOE analysis showed a payback range of 3.6 to 19 years)
  - Product availability and infrastructure for “non-conventional” products is not yet broad based
- Major water heater manufacturer’s supported in principle an Energy Star program for water heaters
  - Agreed with DOE conclusion on points 2 and 3 above
  - Objected to a proposal excluding electric water heaters entirely as well as proposed implementation date
- May make more sense to emphasize high efficiency water heating as a key component of an Energy Star home than to further pursue product criteria
How Builders Can Promote High Efficiency Water Heating

- Offer options or packages; illustrate benefits like performance, energy and operating cost savings. “Rough-in” plumbing for solar and tankless for future installation
- Sell water heating and indoor comfort systems like other upgrades, such as high efficiency windows, security systems, surround sound. Give the homebuyer choices
- Promote the existence / availability of Energy Efficient home loans
- Keep ZEH affordable and within the reach of the average homebuyer
  - Ideal Homes in Norman OK is introducing ZEH options for under $200K
Final Thoughts, From a Manufacturer’s Perspective

- Water Heater Manufacturer’s R &D resources have been stretched thin due to regulatory changes and requirements.
- Builders and water heater manufacturer’s need to communicate better on product needs and desires.
- Rising energy costs, rebates/incentives and future regulatory requirements will continue to be major drivers towards higher efficiency water heating products being developed by the water heater manufacturers.
Questions???
Thank You!!!