High Performance Boiler Study Are they Reliable?

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Housing Preservation
& Development

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Building Technology

- *Technology is changing*
  - 1980's: glazing changed as we turned from single to dual glazed windows
  - 1990's insulation requirements changing: R30 and above, rigid insulation (today)

- *Boiler Technology changing*
  - 1970's: oil to gas as fuel (and more and more)
  - 1970's: steam to water as medium of heat exchange

- *2000s*
  - More efficient heat exchangers (high performance boilers : 85% plus
  - Move to sealed combustion (condensing boilers)

Typical New Construction Building

Components of High Performance

- *Specifications now include:*
  - High Performance Boilers
  - R-30 insulation and above in roofs
  - Room heat controls, moderation of inside temperatures in conformance with outdoor (outdoor reset)

- *They have recently changed.*
  - In 2006-2008, architects began to adopt higher performance specs.
  - In 2011, I studied 24 buildings pre and post high performance.

- *Results:*
  - Conventional buildings had scores of 13 or higher.
  - High performance buildings had median scores of 9 (25% better).
  - Scores were based on BTU's – fuel consumption corrected for building size and climate.

2012 Reliability Study

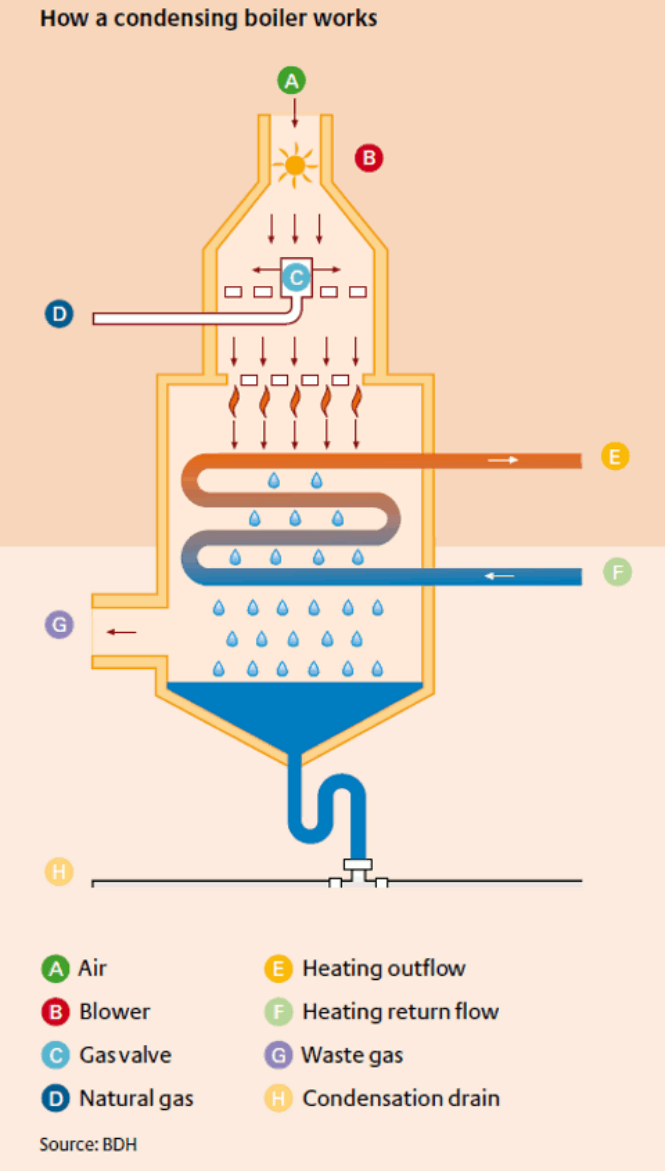
- *29 buildings sampled*
  - 8 HDC multifamily buildings
  - 10 SHLP buildings
  - 11 weatherization buildings: 4 AEA, 7 Enterprise

- *New vs. Rehab*
  - 11 new buildings
  - 4 rehabs
  - 14 retrofits

- *High performance or condensing*
  - 7 had high performing atmospheric boilers
  - 18 had condensing boilers
  - 4 had sealed combustion non-condensing boilers

High Performance Boiler

Characteristics of a Condensing Boiler



- Unit is sealed – intake and exhaust of air assisted by fan; there is no chimney.
- Boiler condenses the exhaust gases, releasing energy that went into gases at combustion.
- Outdoor reset controls temper the amount of heat delivered to outdoor temperature.

Problems

- Condensing Boilers are more highly automated. Because they do not rely upon a draft to feed the boiler, rather on fans, when the boiler senses a warning, it shuts down.

- Controls are contained in a small motherboard on the boiler itself. When the control malfunctions, it typically has to be replaced @ $1000

Results of Survey

- In 7 high performance boilers, each came with faulty wiring that required contractor intervention. Otherwise, these all operate very reliably.

- In the 18 condensing boilers, there were only 5 initial problems: 2 with heat exchangers (needed to be replaced); 1 needed a motor replacement; 1 needed new motherboard; 1needed staff training.

- In the 4 non-condensing sealed combustion boilers, there were no initial issues.

Recommendations

- Boiler Manufacturers need to provide more factory support at startup.
- Boiler industry is a fragmented one, like the construction industry. There is much less dealer support than in, say, the auto industry.