EfficiencyFirstCalifornia

Formerly CBPCA

The Benefit of Heat Pumps and Hydronic Air Handlers

When you add insulation to a home and tighten up the building envelope, the heating load drops much faster than the cooling load. This makes sense because the winter delta-T (temperature difference between inside and outside) is much greater than the cooling load. This creates a problem when sizing a furnace.

The furnace must be sized to handle the cooling CFM even if that means selecting a model with several times more heating capacity than the load. In mild climates, it's not unusual to see furnaces hugely over-sized.
Installing a *gas furnace is usually a poor choice for high performance homes*. Over-sizing causes comfort issues. Homeowners who invest in a super-efficient retrofit expect their homes to be more comfortable, not the opposite.

Some contractors try to overcome this by installing an expensive multi-stage variable-speed furnace to resolve these issues. Multi-stage burners mitigate the capacity issue somewhat. However, less expensive alternatives can do a better job of capacity matching.

Virtually all modern furnaces have electronic

Innovative Solution: In warm climates with average or better electricity rates, the heat pump is the best heating system. It costs less to operate than a furnace and may give you the ability to offset with photovoltaic (PV)—check your utility rates. If the home has been tightened up and well insulated, installing this system can make a home more comfortable then a gas-fired furnace.

Hydronic Air-Handler

Installing a hydronic air-handler, with a condensing coil for an air-conditioning option, is a good choice where a low cost of natural gas is available to power the water heater, tank, tank-less or boiler. An asset to this system is the fan speeds for heating and air-conditioning are the same; air delivered is consistent (volume and velocity) and at a lower temperature. Lower temperature air (less buoyant) delivered at the right velocity and with the right grill will create a more even temperature

controls that enforce a minimum run-time. When a furnace is grossly over-sized, the furnace will experience significant overshoot during spring and fall, when peak heating loads may only be a few thousand Btu per hour.

During the heating cycle, the temperature of the air being delivered to the supply registers can be between 90 to 120 °F. Air that is entering a room at that temperature becomes buoyant and does not mix well with the air in the room creating a stratification problem—the warm air will reach the thermostat and shut the system down before all the surfaces (thermal-mass) reach temperature, causing the system to cycle in both the heating and cooling mode.

In the heating mode, another issue is when hotter air moves through the distribution system it creates
a greater delta-T across the surface area of the system components (i.e., ducts and plenums), leading to greater conduction losses. Why are heat pumps, hydronic forced air systems and combination systems ideal for heating high performance homes?

These systems are more appropriate because system capacity can be aligned more closely with the load. This ensures good air mixing at design conditions, an important prerequisite for comfort. Deciding which is best for a given project depends on the climate and relative energy costs.

throughout the room. A lower temperature also means lower conduction losses throughout the system.

One additional point to note is that if this system is installed as a replacement to an existing gas furnace, the supply register locations will have to be changed so that low temperature air will not flow directly on the occupants. You will, however, need to complete some ceiling patching and painting. If the supplies are installed in the floor, you can block and insulate the floor and leave the existing registers in place and ask the homeowner to change the floor covering. This will add a little cost to the job, but well worth the results i.e., comfort. A majority of the existing home stocks have the supply registers located on the outside walls over or under the windows. This was needed to drive warm air in the winter to keep condensation from forming on single pane windows.

With the introduction of double pane high performance glass this is no longer needed. You now can move the supply registers to the inside walls which will help shorten the duct runs (less duct conduction) and put the ducts in an area where they can be effectively buried in insulation (deep buried ducts) and not on an outside wall where the space is next to a hot roof.

It is not that expensive to change from AC/furnace to a heat-pump/air handler setup and it's also not that hard if you install the system in the same location. However, changing to an air handler gives you the advantage of centralizing the system. In terms of the cost, it all depends on the house size, how many registers you have, and if you need to relocate them or not.

This is not a tough sell if the contractor, that is selling home performance, understands the benefits of switching to a hydronic heat pump air handler. It is more efficient because it operates at a lower temperature and brings the temperature up slowly, it is quieter, and it's more energy efficient.

There are additional considerations when making this change. If this article has peaked your interest, please contact Andy Simms to go over some other

SMUD™

Upcoming Event

SMUD/Contractor Meeting
June 21st. 2013 at 2 PM

Location: SMUD Rubicon Room
6301 S St. Sacramento

details, such as grill placement, etc...

Article by Andy Simms,
Technical Analyst
Efficiency First California

Sources:
energyvanguard.com
greenbuildingadvisor.com

follow on Twitter | friend on Facebook | forward to a friend

Our mailing address is:

1000 Broadway, Suite 435, Oakland, CA 94607
1-888-352-2722 (1-888-35CBPCA)
www.efficiencyfirstca.org