Micro-zoning for Comfort, Profit, and Fuel Conservation

by Dave Yates and John Vastyan

Adding a micro-zone to a multi-zone hydronic system can be accomplished easily if accommodation was made for it during the system's initial design. Sadly, that's not often the case.

As many of us in the field know well, there are plenty of downstream needs for a new zone or two. Remodeling projects may require it, or perhaps one part of the home requires additional heat.

A few simple steps can increase your bottom line while delivering unsurpassed comfort for your customers. The devil is in the design details, however.

The foundation that ensures success is an accurate heat loss calculation. One of the software tools we use for this is Watts Radiant's "RadiantWorks Pro." There are a number of hydronic design programs that can be used for this purpose though. The key is finding one that you find fast and easy to use.

The first thing to look at is the effect that the new zone will have on the heat plant. Short-cycling, which you want to avoid, can drag a boiler's efficiency down well below 50 per cent. And all those stuttering stop/start runs can lead to flue gas condensate within the boiler. Keep that up and it will rot out a boiler in less than a year.

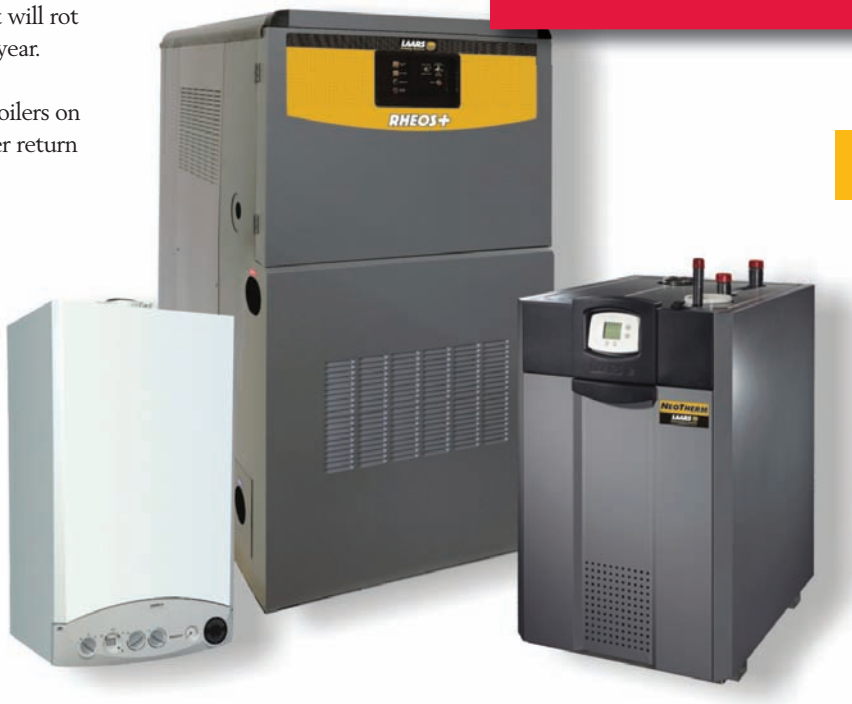
Modulating-condensing boilers on the other hand, love colder return water temperatures and need to operate within sustained flue gas condensation temperature ranges for peak efficiency. However, mod-cons may have lower limits for minimum BTU output, so you'll need to determine if it, too, will short cycle, as this can take a toll on switches, relays and gas valves.

What's in a Zone?

Adding a zone may at first appear to be a no-brainer. That is, until you look beyond the components and consider how large the overall impact can be.

Consider the possibility that the change:

- may reduce the life-cycle of system components
- could increase energy and fossil-fuel consumption by lowering operating efficiency (both electrical use and BTU production)
- may create an imbalance in the delivery of comfort-energy



Fast Fact

The acidic flow of flue gas condensate can wreak havoc with masonry chimneys too, creating points of entry for deadly carbon monoxide into a home or apartment.

Read more on micro-zones and modulating condensing boilers continuing on pgs. 42 and 43

Beyond the Boiler

Continued from page 38

For many years, when considering system efficiency, our focus has been fixed on heat plant fuel consumption. Radiant and other low-temp distribution methods are now appreciated for their ability to enhance efficiency and comfort. It seems we're finally circling back around to an oft-ignored facet: circulation efficiency. Thermal and electric efficiency are bound to one another.

Keep in mind that if micro-zones gang-up, you can have too much of a good thing. Granted, dividing up an entire building into micro-zones offers greater control, but it can lead to parasitic energy consumption. Energy consumed to transport energy adds up. You can't ignore the cost to transport BTUs from the boiler to its place of distribution.

Take for example a home with 15 micro-zones, each with its own circulator. Add a high-head circulator to handle the mod-con's required flow. With outdoor reset to achieve near-constant circulation, system circs could see 3,000 hours of run-time each year. At 20 cents per kWh, that comes to $432 per year. In two decades, calculating in a five per cent rise in electricity cost each year, the end-user could spend more than $14,000 just to push the fluids around!

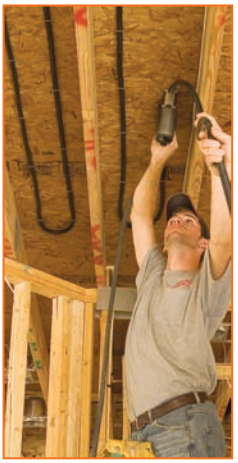
Fortunately, circulator technology is evolving. Entering the hydronics arena today is a variety of variable-speed, ultra-low-wattage models that can react to changes in pressure or temperature to vary speed and flow rates. Using one of these new variable-speed, variable-watt circulators for micro-zones, the 15-zone system can run with two circulators and 15-zone valves, dropping electrical costs to $147 for the first year. In 20 years, with the same five per cent increase each year, the projected total costs are $4,860.70 – a savings of nearly $9,500!

Thinking Mod-Con?

Modulating condensing boilers are designed to conserve fuel and increase comfort. With an "eye" on weather conditions, a boiler's firing rate is lowered to match the building's heat loss by using a programmable outdoor reset ratio control. Return water temps are intentionally kept below 140°F so that flue gas water vapour will condense, forming a ready source of harvestable heat. For every 100,000 BTUs burned, a gas mod-con will yield one gallon of latent heat-rich condensate water. For oil-fired boilers, that 100,000 BTU input will yield a half-gallon of condensate water.

"The key is to be sure an installation is suited to mod-con operation," says Tom Gervais, manager of Laars Heating Systems in Canada. "Mod-cons are ideally suited to lower-temp and radiant heat uses. High-temp application robs them of the internal condensation they need for optimal, high efficiency operation."

Also, according to Gervais, you can run into problems with misapplied mod-cons coupled with outdoor reset when ambient temps go real low. If an installer doesn't heed a manufacturer's outdoor settings, a mod-con will reach the stack limit and shut off at the worst possible time – when "no heat" risks are highest.



Pro Tip

When considering a Mod-con:

Be sure the application is ideal for a mod-con.

Set the outdoor reset not to exceed 140°F fluid temps.

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