

BACK TO THE BASICS OF HYDRONIC CONTROLS

Overall system health must be optimized in order for smart controls to be effective.

Hydronic heating is one of the most comfortable ways to condition a home, and when a well-designed and properly installed system is paired with the appropriate controls, end users all but forget the system is even there.

But, too often, hydronic systems are not maintained to that standard, nor are the controls properly matched to these systems. That, Uponor Single Family Segment Specialist **Tim Botten** says, can spell disaster.

“You have to investigate the entire system — not just the controls but the piping, the [distribution] system, the valves, the pumps, the boilers. It’s a complete symbiotic relationship,” he says. “The one thing I tell people is that there’s no controls manufacturer today that can compensate for a poorly designed or improperly installed system.”

GETTING BACK TO BASICS

Taking a holistic approach to a hydronic system is the key to ensuring it is operating at peak efficiency while providing optimal

comfort to the home’s occupants. Simply adding smart controls to a system with the expectation it will rectify existing comfort or efficiency issues is akin to putting lipstick on a pig.

“You need to think about the system as a whole — not just each part as a separate entity,” HBX Control Systems Director of Sales and Marketing **Kevin Vieira** says. “From a controls standpoint, you need to know what the control does or does not do before starting the design. Controls cannot be put on after the fact and be expected to perform properly all the time.”

Understanding how all the components within the system interact with each other is vital, says Watts Radiant Application Engineering Manager **Kolyn Marshall**.

“There are boilers, circulators, thermostats, and a wide array of components that make up a functioning hydronic system,” Marshall says. “Understanding how each of those work will help eliminate unwanted component conflicts and will increase system performance.”

Jay Vath, product manager for tekmar Control Systems, says the KISS rule — “keep it simple, stupid” — should be observed when designing new systems.



Photo credit: Taco Comfort Systems



Taco's ECM wet rotor 00e VR1816 circulator offers up to 85% savings in energy consumption compared with standard circulators of the same size.

"If the designer cannot easily explain the sequence of operation of the system, then it's too complex," he says.

While wireless technology and smart controls certainly have their place in the realm of residential hydronic heating, many users either don't utilize these available features or unknowingly misuse them, Botten says.

"I don't need to put in these extra valves, controllers and modules to make a system work," he says. "It looks impressive, but is there any more efficiency? The simplicity is key."

In addition to negatively affecting energy efficiency, adding smart controls to an existing system that is not maintained can decrease system longevity, Taco Canada Vice President of Canadian Governance and Product Management **Steve Thompson** says.

"With smart controls, controls may not be communicating with each other properly. An example of this is a boiler's smart control not communicating with a pump's smart control," Thompson says.

"If this happens, an installer won't be able to deliver the energy savings benefits — or optimal comfort — that could be achieved. Ultimately, there's also the risk of premature component or system failure."

"System efficiency is more than ever tied to controls," Vieira adds. "Over-designing leads to less efficiency because not everything works together properly, and control setup is a big factor. Just having your reset schedule set wrong for your area can lead to inefficiencies that the system can't deal with."

That being said, smart hydronic controls have the potential to drastically improve comfort and efficiency — but only when appropriately matched with both the system and the needs of the end user.

"They add usability and ease of use for all involved," Vieira says. "The end user will find it easy to make adjustments to temperature and is able to view system efficiency in regards to their utility costs. The contractor can view and monitor installs without going to site. This provides better customer service to the end user and can help reduce problems before they happen."

COMMON MISTAKES TO AVOID

When designing a hydronic system, simple is often the way to go.

"Even though our business is selling controls, we see too many designs that have too many devices to control," Vieira says. "The hydronic industry needs to see that we are more expensive than the traditional systems already, so don't also over-design and make it a mouse trap."

Oversizing is also a common mistake, Thompson says.

"In general, this causes low ΔT , which leads to cycling issues," he says. "Also, high-velocity water leads to comfort — or shall I say *discomfort* — issues. There's also the importance of circulator location, valve location, the proper placement of air separators and expansion tanks, and the need to understand the benefits of air separation and when to use it."

Since hydronic systems are easier to zone than forced-air, some designers and installers go a little overboard with zoning, which can also cause problems.

"We refer to this as 'micro-zoning,'" Vath says. "Installing many very small loads often results in boiler short cycling, which reduces boiler efficiency and increases

wear and tear on ignition systems"

In radiant hydronic systems, improper floor coverings can cause issues, Marshall says.

"One of the biggest mistakes in design is understanding how the various floor coverings and construction profiles work in relation to each other," Marshall says. "Carpeted areas generally require higher fluid temperatures than tile. Grouping these together on the same distribution system means the tiled areas may get significantly warmer than the carpeted areas, resulting in uneven floor temperatures or even comfort issues. Likewise, zoning a first-floor staple-up system and a basement slab system together may result in an imbalance in operation where one area is over-heated while the other is under-heated."

During system installation, communication between subcontractors is vital to ensure the system will work well as a whole.

"A common mistake that we encounter is that the installing contractor starts piping the mechanical system without consideration of the control strategy," Vath says. "It is important to have the mechanical and control strategy designed together prior to installing equipment."

Marshall says other possible mistakes to avoid include using the wrong length of tubing so circuits are too large, which can cause pressure drop and inconsistencies in temperature; installing only one circuit at a time, which can result in both ends of



Taco's ECM wet rotor 00e VR1816 circulator offers up to 18 feet shut-off head and 16 gpm flow.

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a single circuit being connected to the same supply or return manifold; and running all the thermostat wire at once without marking which wires go where, which can wreak havoc with zoning when wires are all but impossible to identify.

Not taking closed-loop system water quality into account can also be a major error, Thompson says, adding that magnetic separation can help reduce iron oxide and improve ECM longevity.

IMPROVING HYDRONIC INSTALLATIONS

Ultimately, improving hydronic system performance, comfort and longevity starts not with hydronic controls but with training and education.

“Have more hydronic training at trade schools,” Vieira suggests. “In Europe, hydronics is a trade in and of itself. Most manufacturers in our industry offer all sorts of training, and a lot of times, it’s free.

“There are a lot of good hydronic forums on the web where any questions in regards to vendor product information and troubleshooting tips can be answered instantly,” he adds. “**HeatingHelp.com** is a great resource for beginners and industry veterans.”

Thompson also recommended HeatingHelp.com in addition to Taco’s in-house training opportunities.

“Most manufacturers offer excellent training,” he says. “At Taco, we take it seriously. Guys like **Dave Holdorf**, **Rick Mayo**, **John Barba** and **Rich Medeiros** have devoted their entire lives to providing excellent training for Taco, and we have loads of manufacturer’s reps and wholesalers who also have superb training capabilities, too.”

tekmar’s leaders believe training is “critical to the success of the hydronic industry,” Vath says. “The training should consider both the overall system design and detailed information on individual components.”

One of those components is controls, and not understanding controls or how they interact with the system as a whole can result in potentially catastrophic system-wide issues.

“Controls help identify what areas of the system need heat and how much,” Marshall says. “The better the controls are designed, the more efficient the system runs by identifying how much heat is needed at any given time. But failure to understand what the intent of the system is may result in a poorly designed system, omitted features, and overall performance issues.”

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