For Immediate Release

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MCTAVISH RESIDENCE, PARKER, COLORADO

Integration Controls Are "King" For Elaborate, Energy-Efficient Home

Article overview: This large residential remodeling project in Colorado involves state-of-the-art comfort system to maximize energy efficiency: solar, geothermal and radiant heating, plus energy recovery ventilators for the main residence, ventilation of the pool house and snow melting for the exterior.

Orchestrating this elaborate setup is an Uponor Climate Cŏntrol™ Network System that keeps the various components running at peak efficiency without sacrifice in comfort and convenience to owner Tim McTavish and his family. "I never would have proposed a design like this one," says system designer and installer Al Wallace, "if I didn't have the Network System."

BY KIM BLISS

PARKER, COLORADO — When Tim McTavish set out to remodel his Parker, Colorado, home, his plans called for added square feet for living space, radiant floor heating throughout the entire structure, snow melting for exterior surfaces, and an in-ground swimming pool. But McTavish, a self-proclaimed techno-junkie and aficionado of sustainable, energy-efficient building concepts, was looking for exceptional means to heat and cool his newly updated residence.

"It all started because I wanted an energy-efficient way to keep the pool warm," McTavish recalls. "I explored all the different options available, and I settled on solar."

However, solar was just the beginning. After a meeting with Al Wallace, president of Energy Environmental Corporation (EEC), a Centennial, Colo.-based company specializing in design, installation and consulting of integrated renewable energy systems, McTavish's home was completely overhauled with an elaborate, energy-efficient design.

Wallace was responsible for installing 64 solar panels generating 2.5-million BTUs per day; four 125-gallon solar tanks; a five-ton, water-to-water ground-source heat pump (GSHP) for hot or chilled water; a four-ton water-to-air and a three-ton water-to-air GSHP (which both use the pool as a virtual ground loop); two boilers; a pool and hot tub mechanical room; energy recovery ventilators (ERVs) on the main house; ventilation on the pool house; radiant floor heating; snow melting; four heat exchangers; a 120-gallon domestic hot water (DHW) tank; two 50-gallon tanks for the radiant system; a heat-extraction system under the pool pavers that directly feeds the ground loop or the pool … and last, but not least, a control system to integrate it all.

According to Wallace, you can have all the energy-efficient systems built into a house you can imagine, but if they're not controlled properly, you won't get the maximum efficiency of the complete system. The real energy efficiency comes from integrated control of all the individual systems.

"The overall energy efficiency of a house is in the controls — controls are king," says Wallace. "For example, if you're putting in a high-end geothermal system, but using controls from the 1950s, you're losing a lot of the efficiency of the geo."

Wallace said he found his "King of Controls" while at a training class at Uponor headquarters in Apple Valley, Minn., in the spring of 2009. There he was introduced to the Climate Cŏntrol™ Network System. "I was attending a class on radiant wireless zoning," he recalls, "and I was talking to the instructor about integrated controls for energy-efficient systems. He told me about the Climate Cŏntrol Network System and I thought, 'That's exactly what I'm looking for!'"

Wallace sat down with Ray Blum, heating manager with local distributor Dahl of Denver, to see just what he could do with the system. "We started with just the heat pumps and the solar," recalls Wallace. "Then we started adding more and more to the system. It was incredible what we could do with it."

Wallace says that when he initially proposed his design to McTavish, the Climate Control Network System was the only option he recommended to control all the systems in the elaborate setup efficiently. "I would never have proposed a design like this one if I didn't have the Network System," says Wallace.

Total Control for Maximum Efficiency

When it came to controlling the systems in and around his home, McTavish wanted more than just simple temperature set point change control — he wanted total control for maximum efficiency.

"Because we had so many parts, I wanted to make standard rules about what temperatures certain things occur," he says. "Given the solar resources and geo and natural-gas boiler, I wanted to determine when certain components go on and off to make the system the most energy-efficient. Because the Network System is object-oriented, we can make a change to any device based on the input of any other device."

For example, all the thermostats in the house have up to nine different possible set points, based on the current heat sources: solar, water-to-air or water-to-water heat pumps, or a boiler. Here is how the system works:

Solar: In the winter, the solar array's primary purpose is to heat the four solar storage tanks. The water in the tanks directly heats the main house (via radiant floor heating) and indirectly heats the main-house DHW. Even after the solar array is no longer active (because the sun is beyond a useful angle), the system continues to pull heat out of the four storage tanks for radiant floor heat and DHW.

Water-to-air heat pumps: But once the temperatures in the four tanks drop to where they are no longer useful for radiant and DHW, the system automatically changes the heat source, now heating the house with the water-to-air heat pumps that continue to pull heat from the four solar storage tanks until their temperature is down to 42 degrees.

Condensing boiler or water-to-water heat pump: "At that point," says Blum, "we revert to our third and final pair of heat sources for the radiant floor heating system: a gas-fired modulating-condensing boiler or an electric water-to-water heat

pump, depending on the required radiant floor water temperature and depending on which source is cheaper to run.

"The awesome advantage of dropping the tank water temperature that low is that, as soon as the sun hits the solar panels the next morning, we already have enough temperature differential to start heating the four solar storage tanks," Blum continues. "This allows us to switch from boiler mode to water-to-air heat pump mode (while we continue to raise the solar storage tank temperature). Once the tanks are hot enough, we change to solar mode and, once again, heat our radiant floor directly from the tanks."

According to McTavish, even at currently low prices for natural gas, as long as the storage tanks are above 40 degrees, it is more efficient to draw heat from the solar storage tanks than use the gas forced-air system.

When it comes to heating the pool, McTavish can use a combination of four options, depending on the heating demand and which is the most energy-efficient:

- deck pavers with a hydronic radiant system underneath;
- solar hot water panels;
- the 5-ton water-to-water GSHP, which runs against either the pond or heat-extraction pavers;
- two other GSHPs (the 4-ton or 3-ton water-to-air unit).

"In the summer, the heat pumps cool the house by dumping the heat to the pool," explains Wallace. "That process is 800%-efficient. For $1 of electricity, they're getting $4 of cooling in the house and $4 hot water heating in the pool.

"In the winter," he continues, "the heat pumps can run directly against the solar hot water storage tanks to heat the house directly via the forced-air system."

Control Convenience

"Out of the box, Network will do an occupied and an unoccupied mode," says Blum. "To further meet McTavish's needs, we were able to add a vacation-occupancy mode with a little extra, custom programming."

The vacation-occupancy mode helps save additional energy costs for the McTavish residence. For example, when McTavish is away for two weeks in February or March,

the Network System in vacation mode activates the solar to heat the house to 80 degrees during the day. Consequently, it never cools down to the 55-degree set point at night. The only energy expended to keep the house warm is running a few circulators during the day.

When McTavish puts the house in vacation mode, he can do so at single point in the system, but it affects everything on the Network: That is, it drops set points, shuts off recirculation pumps, etc. What's more, all of this is accomplished with minimal interaction from the homeowner.

Switching to vacation mode — or any other — can also be done remotely. If vacation plans change, the user can extend or abbreviate the vacation mode. "McTavish was able to make changes to his system while on a different continent," says Blum. "When he was in Africa on a mission trip, guests came to stay at the house, and he was able to set the temperatures for the time the guests were there and change them back after they left."

"Having internet accessibility is the best feature of all," says McTavish. "I look at my system on a daily basis — whether I'm at home or away. I look at the heat coming off the solar panels, check to see how long the boiler's been running, observe the outside temperature, and monitor the swimming pool temperature. It's nice to be able to track all that in real time."

Better than DDC

According to Blum, who has commissioned seven Network Systems in the greater Denver area and has a background in DDC (direct digital control) systems, Network offers residential contractors several advantages over DDC.

"My first DDC project was a home west of Boulder," he recalls. "Several VPs from Honeywell wanted to tour the home to understand why a residential structure would need DDC. For McTavish, as far as integrating a system with this level of complexity, you're really looking at a DDC platform.

"The nice thing about Network is, out of the box, it's preprogrammed to do a bunch of different functions, but a DDC is typically blank. While the Network is completely customizable, the only programming required is what you want above and beyond what the system already has."

This preprogramming delivers another advantage: time. According to Blum, programming a "blank" DDC must be done from scratch. "If we had to run all the McTavish programming from scratch, it would have taken about four times as long as the Network took."

Blum states Network's "finished look" is another benefit as well. "It's hard to get homeowners to spend money on things they don't see," he remarks. "With Network, we can produce really nice graphics in an interface that is comfortable for homeowners. This way, they really get to see what they're paying for."

Wallace concurs, "When you're in a price war over a commodity like GSHPs, offering an integrated control package with a user-friendly interface like Network can give contractors a competitive edge. I think consumers are looking for this kind of system, and it would be in contractors' best interest to learn more about total system integration controls. It's not that hard to learn, yet it's very powerful."

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Uponor, Inc. is a leading supplier of plumbing, fire safety and radiant heating and cooling systems for the residential and commercial building markets in the United States. Uponor, Inc. employs 380 people at its North American headquarters in Apple Valley, Minn. For more information, visit www.uponor-usa.com or call (800) 321-4739.

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http://uponor.oreilly-depalma.com/casestudies/integration_controls.shtml

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