Advanced Heating and Hot Water Systems

CASE STUDY:

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CASE STUDY: PINE RIDGE ASSISTED LIVING IN WISCONSIN RAPIDS AND COLBY, WIS.

Condensing Boiler Tandem Delivers Energy-Efficient Heating to Assisted Living Facilities

93%-efficient Munchkin boilers, made by HTP, power in-floor radiant heating systems, controlling fuel costs and delivering dependable comfort.

"Building owners aren't looking at just upfront costs for a heating system anymore, but at the total cost of operation," says Craig Ouimette, service manager at Cardinal Heating & Air Conditioning in Sun Prairie, Wis. Heating, ventilation and air conditioning (HVAC) contractors across the country are encountering the same new reality, as energy costs continue to rise.

Installer Craig Ouimette (right) and Fred Miller of Miller Construction with the two Munchkin boilers that support the radiant heating system at Pine Ridge Wisconsin Rapids

To that end, contractors are looking for efficient equipment that will provide a lifetime of energy savings, as was the case when Ouimette was retained to install space heating systems in a pair of new 40-bed, 26,000-square-foot, assisted living facilities, located in Wisconsin Rapids and Colby, Wis.

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Radiant Heating – Easy Choice: From the outset, Ouimette recommended installing in-floor radiant heating in all the common areas of both facilities, which operate under the name of Pine Ridge Assisted Living. Each radiant system would be supplied with hot water by a pair of high-efficiency, modulating and condensing boilers.

"In-floor radiant heating was the best option" for the two assisted living facilities, according to installer Craig Ouimette, because radiant heating "makes it easier to fine-tune the comfort level for the elderly residents."

"In-floor radiant heating was the best option, because it makes it easier to fine-tune the comfort level for the elderly residents," says Ouimette. "It also has the capability of zoning, so the building could be equipped with multiple thermostats to maintain different temperatures in different areas, depending on usage. In fact, the property management for both facilities had an idea that this was what they wanted, too."

Energy savings were another advantage, Ouimette points out. "By upgrading to a high-efficiency, condensing and modulating boiler system to run a low-temperature application like radiant, a building owner can cut 30% to 40% in his fuel bills, as compared with a conventional system."

Mid-Efficiency vs. High-Efficiency: During the planning phase for the first unit to be built, Pine Ridge Wisconsin Rapids, there was talk of installing mid-efficiency boilers. "Mid-efficiency" refers to boilers with thermal efficiency ratings of 78% to 82%. The problem was that this boiler type would have required a large masonry chimney to vent the gases that are the by-products of its combustion process. High-efficiency, modulating and condensing boilers carry a price premium over their mid-efficiency counterparts, but Ouimette was confident that the savings from not having to build a chimney would offset this price differential.

"Condensing boilers extract so much heat during the combustion process," explains Ouimette, "that the resulting low exhaust temperatures allow us to vent it through the roof with Schedule 40 PVC pipe, which costs much less in terms of both materials and labor than a masonry chimney." The upshot: "There was no selling on the heating side – the owner went with our recommendation," says Ouimette, who specified two Munchkin 199M modulating boilers, made by HTP at the company's plant in East Freetown, Mass. Ouimette sourced the boilers through HTP's local sales agency, Milwaukee-based Hot Water Products, Inc. "If we find a product that

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works well for us, and its manufacturer has good people on the ground here backing us up, it doesn't make any sense to change."

The integrated boiler management system that controls the two stacked Munchkin boilers switches from unit to unit to assure equal run times, so that neither becomes the workhorse of the system.

No Need to Mix Down the Water: The advantages of the high-efficiency condensing boiler system extended beyond the venting. Going with a traditional mid-efficiency boiler, which heats the water up to 180°F to 200°F, would have required additional controls to lower the temperature for use in the in-floor radiant system, which operates between 90°F and 120°F. As Ouimette notes, "The minimum temperature that you can run through a mid-efficiency boiler is about 150 degrees. As a result, not only would we have needed a lot of special controls to 'mix down' the water temperature for the radiant, but we would also have had to keep the water hot enough to go back into the boiler, so we did not damage it. Modulating boilers like the Munchkin work just the opposite: the colder the return water, the higher the boiler's efficiency."

Added Control, Heightened Efficiency: To further boost efficiency, Cardinal Heating also installed a 30-gallon Boiler Buddy. "Having very small heating zones with heat losses lower than the lowest modulation rate of the boiler may lead to short cycling, sooting and inefficiency," explains Ouimette. (Short cycling occurs when a boiler fires up, shuts down and fires up again very quickly, wasting energy as a result.) A Boiler Buddy can help prevent short cycling when the building has a very small heat load.

Moreover, the owners of the Pine Ridge properties wanted zoning capability, so they could maintain more precise control over the heat in smaller rooms not in continual use, such as the chapel or the barbershop. "There was no reason to fire up a big boiler to heat the chapel," explains Ouimette. "Instead, we set it up so that they can draw heat out of the Boiler Buddy to heat that little space."

Controlling the entire system was an HTP Vision 3 communicating control that operates the two Munchkins as if they were a single unit. Most importantly, this integrated boiler management system routinely switches from unit to unit to assure equal run times, so that neither becomes the workhorse of the system.

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In addition, the Vision 3 uses a built-in outdoor reset control that modulates the temperature of the water flowing to the radiant heating system based on the weather. “We wanted to maximize efficiency,” explains Ouimette. “On a 40-degree day, we don’t need 110 degrees going through the floor tubing to heat the space – maybe we need only need 90-degree water. Likewise, when it’s 40 below, we want to make sure we have 120-degree water going through the slab.”

Rounding out the system are two HTP Voyager 119-gallon water heaters for domestic hot water, as well as Carrier PTAC (Packaged Thermal Air Conditioning) sleeve units in the individual resident rooms.

Long-Term Savings: Pine Ridge Wisconsin Rapids opened in early fall of 2007, at which point Cardinal Heating started work on the Colby facility, which was completed in April 2008. The heating system in Colby echoes that of Wisconsin Rapids with one key exception: the inclusion of a solar thermal system.

While working in Colby, Ouimette raised the issue of including solar with the builder, Fred Miller Construction Inc. of Madison. Having installed a number of solar thermal systems over the previous two years, Cardinal knew the big savings that were possible.

“The solar thermal systems we’re installing will last 30 to 40 years,” Ouimette comments. “We told the builder he should be able to recoup about 50 percent of the upfront purchasing costs through state and federal tax credits.”

The Pine Ridge Colby facility (above) uses a solar thermal system to provide hot water to its in-floor radiant heating system, working in conjunction with the two Munchkin condensing boilers. The 16 solar collectors can be seen on the facility’s rooftop in this photo.

Intrigued, Fred Miller asked Cardinal for a site assessment, covering system size, total cost, rebate, and payback. Cardinal pegged system costs at $57,600. Tax incentives shrunk that number to only $27,720, a 52% savings. Over the first five years, the owner would also be able to depreciate the $27,720 net investment $17,000, or another 61% savings.

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"So it came down from $57,000 to almost $10,000 in upfront costs to install a solar thermal system in one building," says Ouimette.

Not surprisingly, Miller was sold. Even before Pine Ridge Colby opened, the structure had sixteen 4-foot x10-foot solar collectors on its roof for use as a backup to the condensing boiler system. Miller has not decided yet if he will do the same for Pine Ridge Wisconsin Rapids, says Ouimette.

"Although we haven't gotten the green light, this builder is erecting a boys' dormitory for a church, and he plans on installing solar there. That's because he has seen the savings that are possible, once you get through the upfront costs."

ABOUT HTP: Founded in 1974, HTP is a designer and manufacturer of advanced heating and hot water systems. Product categories include: modulating condensing commercial and residential high-efficiency boilers, indirect water heaters, high-efficiency gas-fired water heaters, solar hot water systems, and oil-fired and electric water heaters.

For more information, visit HTP at www.htproducts.com. Or call toll-free: 800-323-9651 (508-763-8071 if calling from Massachusetts).

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