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ERV Paired With VRV in Transformation of Office Building Into Mixed-Use Space

Installation cost less than that of conventional system

Transforming a mid-20th-century downtown office building into a LEED-worthy mixed-use property without sacrificing the building's 1950s character was the challenge facing developers of The Lux, a multiunit residential property and commercial space in Wichita, Kan., reincarnated from what once was the Kansas Gas & Electric Building.

As always, the devil is in the details—details such as increased ventilation without the energy penalty, not to mention ducting supply air to 86 apartment units in a building originally set up as office space. These and other challenges forced a decision between adapting existing chilled-water equipment (saving on first cost) or starting fresh with a more flexible, higher-efficiency approach.

Paul Black, executive vice president of Wichita-based heating and air, plumbing, and electrical contractor PMC, believed a new system based on variable-refrigerant-volume (VRV) technology from Daikin would provide greater long-term efficiency and reliability.

"We were originally investing in a more traditional (central chilled water) system," developer Michael Ramsey said. "However, Paul understood our desire for LEED certification and said, 'Hey, we've got this new technology, and we'd like you to look at it.'"

As Black explained to Ramsey, VRV systems differ from conventional HVAC systems in that they vary and distribute refrigerant, rather than water or steam, to multiple zones. As a result, they are extraordinarily efficient and flexible. And because they are nearly ductless, they are very adaptable to existing structures where space may be lacking.

An Efficient Fresh-Air Solution

VRV systems offer tremendous flexibility and long-term value. Because they do not incorporate a central air handler as traditional chilled-water systems do, however, they lack a means for ventilation. For ventilation of all of The Lux's commercial spaces and common areas, Black recommended Topvex energy-recovery ventilators (ERVs) from Systemair.

The first and second floors of The Lux are purposed for commercial space, while the remaining six floors are set to house apartments.

Topvex ERVs can be designed to work in concert with a VRV system or operate independently. At The Lux, six vertical Topvex units located on the first and second floors are ducted directly to the VRV units serving those floors. Fresh outdoor air passes through the ERVs, where it is pre-conditioned with return air, and enters the VRV units, where it may be heated or cooled further, depending on space temperature. This significantly reduces the heating and cooling load on the VRV system.

Topvex ERVs are extraordinarily efficient at part-load conditions thanks to electronically commutated (EC) motors. EC motors are designed to operate at high efficiency—even during low-rpm periods—and consume an average of 30-percent less energy than alternating-current motors. The whisper-quiet motors are standard on all Topvex units. As a result, separate variable-frequency drives are not required, which reduces wiring at job sites.

Lighter Equipment, Better Technology

The VRV system and separate ventilation strategy ended up costing less to install because it reduced or eliminated the need for certain materials and equipment. Less insulation and ductwork was required, while the need for variable-air-volume boxes and chilled-water pumps and piping was eliminated.

"If we had gone with a conventional system, we would have also had to bring in two large air handlers to the first and second floor," Black said. "That would have been really tricky.

"Refrigerant piping makes for a much 'lighter' system than conventional chilled water," Black continued. "We believed it was better for the client to invest in technology and long-term efficiency, rather than all that hardware. So this solution actually cost less. Plus, The Lux was able to start out with all new equipment, avoiding future costs."

Of Topvex, Kevin Zimmerman of PKMR Engineers, the firm responsible for The Lux's mechanical design, said: It "definitely goes hand in hand with VRV systems. The fact that it is so compact makes it especially applicable in a retrofit situation like The Lux. The ERVs will also help reduce the high humidity levels that are typical in Wichita and help increase humidity in the winter."

Information and photograph courtesy of Systemair.