

HEATING/PIPING/AIR CONDITIONING
HPAC
ENGINEERING

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Energy-Recovery System Reduces Cost of Cooling Outside Air by 70 Percent

ERV wheel part of school's rooftop HVAC system

By: Airxchange Inc.

The developer of Turtle River Montessori in Jupiter, Fla., wanted the best possible indoor-air quality provided in the most energy-efficient manner.

Brad Brown of KAMM Consulting, the developer's mechanical engineer, approached Charles Eno, sales engineer for Florida Air Conditioning Distributors. Eno recommended a high-efficiency air-to-air energy-recovery-ventilation (ERV) system containing an energy-recovery wheel (also known as a heat wheel or enthalpy wheel) manufactured by Airxchange.

ERV wheels recycle the heating and cooling energy in exhaust air, reducing the load on a HVAC system by as much as 80 percent. This reduction in load not only translates into significant ongoing cost savings, but allows the downsizing of HVAC equipment.

The ERV system installed at the school saved approximately \$25,000 in construction costs. And since the school opened during the fall of 2009, the ERV system has delivered still more savings at the rate of approximately \$6,000 a year, compared with the utility bills the school would have with a conventional HVAC system.



Because the energy-recovery-ventilation (ERV) wheel reduces the outside-air load on the HVAC system, mechanical consultants were able to recommend a rooftop unit about half of the size of the one that would have been required without ERV.

Florida Air Conditioning Distributors prefers ERV wheels manufactured by Airxchange in part because of their Air-Conditioning, Heating, and Refrigeration Institute-certified performance and ease of maintenance. Additionally, Eno knew that, with a standard five-year warranty, Airxchange ERV wheels would outlast aluminum energy-exchange devices in the salt air of Florida's east coast.

Eno demonstrated that by recovering 70 percent of the school's exhaust-air energy and recycling it, the ERV system would allow the architect to reduce the size of the school's packaged HVAC unit by half. The ERV system was paired with a high-efficiency unitary air-conditioning unit on a single plenum curb to minimize internal duct connections and simplify installation on the roof of the school.

The energy-recovery wheel was mounted horizontally, which kept the height of the packaged HVAC system to a minimum and preserved the building's architectural profile. With the ERV wheel in this configuration, maintenance workers have an easy time checking the wheel's operation and changing filters.

PROJECT AT A GLANCE	
Building size: 21,000 sq ft	
Building occupancy: 175 people	
Building design load: 45 tons, satisfied with four variable-refrigerant-flow systems (three 12.5-ton systems and one 8-ton system)	
Outside-air flow at design: 7,500 cfm	
Outside-air load on a "design day": 424,430 Btuh (35.4 tons)	
Outside-air load using energy-recovery ventilation: 132,000 Btuh (11 tons)	
Total recovered energy: 24.4 tons	
Energy-efficiency ratio of HVAC rooftop unit: 10	
Recovery-efficiency ratio of energy-recovery wheel: 90	
Combined-efficiency factor: 17.8	
Improvement over a HVAC system that would cool outside air with no energy recovery: 70 percent	
Estimated first-cost savings from unit downsizing: \$25,000	
Estimated ongoing savings: \$12,000 a year (\$6,000 from the downsized HVAC unit and \$6,000 from energy-recovery ventilation)	

The Airxchange wheel's design includes lightweight, durable, pie-slice-shaped segments that can be removed easily for cleaning on or off site. In less than 30 min, one person can replace all segments with new or previously cleaned spares and return the wheel to service.

In effect, the downsizing of the overall HVAC system paid for the ERV system. Additionally, because of ERV, the school saves approximately \$500 a month on its utility bill.



According to Eno, the system manages all of the school's outside-air ventilation, conditioning the air and feeding it into the returns of all of the air handlers. The air handlers are part of a buildingwide variable-refrigerant-flow system that modulates the refrigerant flowing through the coil. This maintains desired humidity without overcooling the building and prevents the coil from icing up.

“The indoor-air quality is excellent,” Bubli Dandiya, the building's owner and the school's principal, said. “The building is very comfortable, and the air always smells fresh and clean.”

The success of the HVAC system at Turtle River Montessori has led engineers at KAMM Consulting to make use of the same type of ERV design on several other projects. In each case, the Airxchange energy-recovery wheel was specified.