



The HVACR Training Authority

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Rolling Around the ERV WHEEL



⌘ This energy-recovery wheel shows a segmented wheel design, which makes it easier to maintain. It can be removed by one person for cleaning or replacement.

A look at using energy-recovery ventilation and ERV wheels as a means to achieve optimal indoor air quality.

BY RANDALL STEELE

Images courtesy of Airxchange Inc.

According to the Environmental Protection Agency (EPA), studies on human exposure to air pollutants indicate that indoor levels of pollutants may be two to five times—and occasionally more than 100 times—higher than outdoor levels. Considering Americans spend approximately 90% of their time indoors, the EPA and its Science Advisory Board consistently rank indoor air pollution among the top five environmental health risks to the public. In fact, the EPA has estimated that nearly one-half of all illnesses are related to indoor air pollution.

It almost goes without saying that fresh air is a requirement for a healthy environment. Without a continuous supply of oxygen, the emissions from building materials, occupants and indoor activities become concentrated in the air being breathed. Constant exposure to indoor contaminants such as airborne viruses, radon, formaldehyde and a host of other pollutants can impact occupants' health and productivity, becoming major liabilities for building owners and managers.

The most common tenant and occupant complaints related to indoor air quality include asthma and allergies, humidity, stuffiness, tiredness, low productivity, low morale, and dry skin and mouth. Fortunately, these liabilities can be easily avoided with proper ventilation.

The indoor ventilation building challenge

The ventilation challenge for building owners, architects, engineers and facility managers is multifaceted. It includes minimizing energy costs, maximizing comfort, creating productive and safe work environments as well as selecting reliable mechanical systems that are easily maintained.



⤴ Above is a commercial rooftop unit with its slide-out cassette for easy access to the energy-recovery wheel.

Indoor air ventilation regulations for commercial buildings require frequent exchange of indoor air with fresh outdoor air, accounting for up to 50% or more of the total HVAC building load.

However, as outdoor air ventilation rates increase, so does the size, cost and operating expense of HVAC systems. Attempts to reduce these costs by lowering ventilation rates in the 1980s led to sick building syndrome and multiple indoor air quality complaints and lawsuits, resulting in increased minimum building codes to protect the health and comfort of occupants. Recognizing that more ventilation is beneficial, building owners require solutions that provide for the health of building occupants while also controlling costs.

Resolving conflict between IAQ and energy conservation

Building exhaust air, which has been heated or cooled to room temperature is the largest source of wasted energy in commercial buildings. However, with the right technology, it also becomes a large source of useful site-recovered energy.

Energy-recovery ventilation systems utilizing energy recovery or enthalpy-wheel technology capture and recycle this available energy to efficiently precondition outdoor ventilation air before it enters the heating or cooling system. In doing so, ERVs resolve the conflict between indoor air quality and energy conservation by providing affordable fresh air for control of all indoor air pollutants.

Energy-recovery wheels take advantage of site-recovered energy to reduce total HVAC-energy consumption by up to 40%. Without an ERV wheel, the energy in building exhaust air is wasted into the atmosphere while new, additional energy is consumed to heat or cool outdoor air to room conditions.

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Recycling available energy from building exhaust air to heat, cool, humidify and dehumidify fresh outdoor air dramatically reduces outdoor-air energy demand for an overall reduction in HVAC design loads. For most new and replacement projects, ERV costs are typically offset completely by lower HVAC-equipment first cost, while reductions in annual energy costs provide healthy returns for the life of the HVAC system.

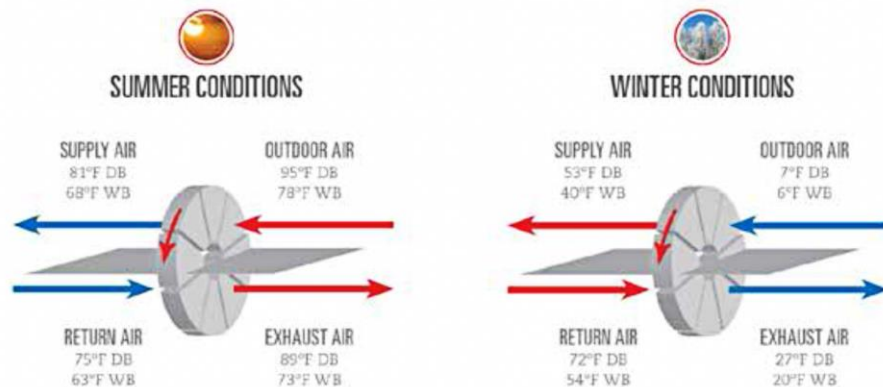
Energy-recovery wheels may also be used to improve the efficiency of relatively new HVAC systems, often providing one- to three-year paybacks or less, when supported by the local utility.

A school in Massachusetts recently benefited from such immediate and substantial savings by integrating energy-recovery wheels into their replacement rooftop units. In less than one year, the school experienced:

- \$60K annual savings;
- 4,727 MBH of heating capacity saved;
- 115 tons of cooling capacity saved; and
- Estimated 265-ton reduction in annual CO₂ emissions.

In addition, many electric and gas utilities offer generous rebate programs to encourage the use of energy-recovery

RECYCLED ENERGY IN THE SUMMER AND WINTER



⚡ In the summer, enthalpy wheels recycle energy to cool and dehumidify outdoor air, reducing air-conditioning load and demand for electricity. In the winter, recycled energy heats and humidifies the incoming fresh air, minimizing demand for fossil-fuel driven heating or humidification systems.

ventilation. The reduction in peak load combined with ongoing operating savings help utilities achieve their mandated energy-efficiency goals. Energy-recovery ventilation is especially beneficial to building owners interested in marketing green, healthy buildings, earning LEED points for increased outdoor air levels and reduced energy costs, while helping to attract and retain employees or tenants via superior indoor air quality.

Humidity and IAQ concerns

Enthalpy-wheel technology enhances the ability of HVAC systems to remove excess humidity loads imposed by outdoor air ventilation providing greater comfort and improved indoor air quality; even in hot and humid climates.

According to the EPA, “outdoor moisture entering by way of ventilation air can cause IAQ problems. Energy-recovery ventilation controls the moisture and saves money.”

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Enhanced humidity control provides a healthier indoor environment while protecting the building from the negative effects of excess humidity. Compared with other humidity-control technologies, this approach provides the most cost-effective, energy-efficient option.¹

Switching to ERV wheels

When evaluating whether ERV is right for a building as part of a planned HVAC replacement or new construction, look for the following:

→**AHRI-certified:** Looking for products that are rated and certified by the Air-Conditioning, Heating and Refrigeration Institute ensures that building owners and engineers design HVAC solutions based on verified performance data;

→**Temperature and humidity transfer capability:** Look for ERV solutions that efficiently transfer both heat and humidity, as this maximizes energy and capital equipment savings for the highest ROI;

→**Easy cleaning and low maintenance:** Seek a solution that is easily accessible for cleaning and maintenance. Energy wheels that cannot be cleaned are less effective over time, resulting in shorter life spans and unrealized energy savings;

→**Performance modeling:** Look for a solution with computerized modeling software that predicts performance and savings. The most accurate programs incorporate weather trends and regional differences; and

→**Trusted provider:** Choose AHRI 1060 performance certified providers to ensure the highest quality equipment and strong customer service.

¹ GARD Analytics Inc., GARD Project No. ASH330.

Randall Steele is Vice President and General Manager at Airxchange Inc. (www.airxchange.com), a privately held manufacturer of energy-recovery components sold to HVAC OEMs with more than 200,000 installations. To learn more about ERV technology and access a free online calculator to evaluate energy savings and cost effectiveness of a complete ERV system for a specific building environment, visit www.airxchange.com/resource-center-savings-calculator.htm.