

RETAIL

FACILITY BUSINESS

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Nothing Wasted

Commercial building owners are caught between two powerful forces: the need to lower energy costs and the need to meet or exceed outdoor air ventilation regulations.

Large amounts of energy are wasted each day from commercial building sites as Heating, Ventilation and Air Conditioning (HVAC) systems replace indoor air with fresh outdoor air multiple times per day. Heating or cooling energy is continually wasted in the exhaust air stream while new energy must be generated and used to pre-condition entering outdoor air. Building owners who fail to capture this wasted energy will continue to incur high energy costs, negatively impacting both property values and profitability.

To address this challenge, many building owners are turning to site-recovered energy (1) technologies such as Energy Recovery Ventilation (ERV). Designed to operate with new or existing HVAC units, ERV technology provides an affordable way to simultaneously cut HVAC energy costs without compromising outdoor air ventilation requirements.

Important HVAC Energy Trends

The commercial building energy sector represents 20% of all U.S. energy costs and is growing more rapidly than the residential energy sector. With HVAC systems consuming an average of 40% to 60% of commercial building energy, owners are searching for ways to reduce these expenses. (2).

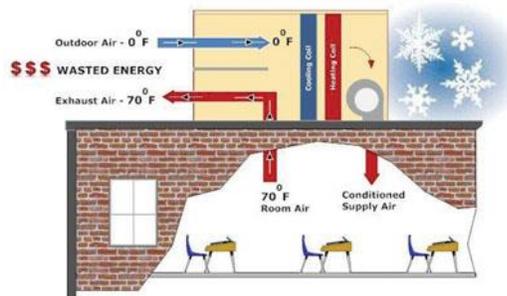
Many organizations are also aggressively working to increase building efficiency. The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) – the organization that established the benchmark national energy standard 90.1 – recently raised energy efficiency levels in its 2010 standard by 30% (3) and proposed the first “green building” standard in 2009. (4) When formally adopted by building codes, these increased efficiency standards will impact HVAC equipment selection.

In addition, many corporations are recognizing the financial and marketing advantages of green building design, prompting many owners to pursue LEED certification or the U.S. Environmental Protection Agency’s ENERGY STAR rating. With increased focus on energy and the environment, building owners are constantly challenged to improve HVAC efficiency without compromising indoor air quality or the company’s bottom line.

HVAC Challenges

Building owners seeking to maximize the profitability of their investments face several HVAC-related challenges and opportunities including: minimizing wasted energy, replacing existing HVAC equipment and cost-effectively meeting or exceeding outdoor air ventilation requirements.

1. Minimizing Wasted Energy



A large portion of HVAC energy can be attributed to conditioning outdoor air ventilation. As fresh air is drawn into the building, stale air is expelled along with energy used to condition it. This energy-rich exhaust air represents the largest source of wasted energy in most commercial buildings. By failing to recapture this site energy, owners will continue to face rising energy costs, lower profitability, and missed opportunities to lower greenhouse gas emissions. (See Figure 1.)

2. Existing HVAC Equipment

Upgrading HVAC equipment provides an opportunity to lower building energy use; however, many energy-efficient technologies are perceived to be expensive. Fortunately, proven technologies are available to improve HVAC system efficiency and provide attractive returns. Building owners willing to apply these technologies can successfully reduce energy consumption and greenhouse gas emissions in existing buildings, often with local utility support.

3. Outdoor Air Ventilation vs. Energy Cost

Studies have proven that outdoor air ventilation creates a healthier work environment. According to the EPA, “Indoor air can be 2 to 5 times more polluted than outdoor air... [and] that increased amounts of outdoor air supply is generally better for indoor air quality.” (5)

However, as outdoor air 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 building codes to protect the health and comfort of occupants. Recognizing that more ventilation is beneficial, building owners must find a solution to provide for the health of its building occupants while also controlling costs.

The Solution: Energy Recovery Wheel Technology

Energy recovery wheels, also known as enthalpy wheels, resolve the conflict between indoor air quality and energy conservation by recovering site energy contained in building exhaust air. Up to 80% of this energy is recycled to precondition outdoor air, resulting in reduced HVAC load and operating cost.

For new and replacement projects, energy recovery costs are typically offset by lower HVAC system first costs while up to 80% reductions in outdoor air fuel consumption provide healthy returns for the life of the HVAC system.

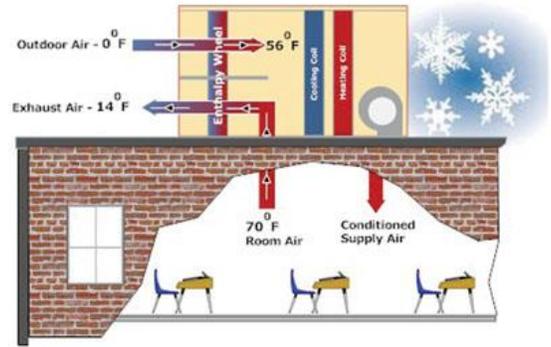
Energy recovery wheels may also be used to improve the efficiency of relatively new HVAC systems providing 1- to 3-year paybacks or less when supported by the local utility.

Finally, energy recovery wheels enable building owners interested in marketing green, healthy buildings to increase outdoor air levels above minimum code, earning LEED points and reducing the risk of indoor air quality complaints.

How Energy Recovery Wheels Work

Enthalpy wheels transfer energy by rotating between outdoor air and exhaust airstreams to transfer heat and moisture from one airstream to the other. AHRI certification verifies the effectiveness of this energy transfer.

Total energy saved depends on the wheel's effectiveness and the difference in temperature and humidity between the two air streams. A bigger differential drives larger energy savings. (See Figure 2.)



Benefits of Energy Recovery Wheels

Energy recovery wheels offer many benefits, including:

- Reduce outdoor air energy costs 60% to 80%
- Reduce capital equipment cost by minimizing HVAC design loads.
- Increase outdoor air levels 2 to 3 times without adding load to existing HVAC system.
- Cost-effectively improve HVAC system's control over indoor humidity to prevent mold and mildew.
- Maintain building values by maximizing outdoor air ventilation and building health, thus creating positive public relation opportunities.
- Enable building owners to participate in energy programs such as ENERGY STAR.
- Provide instant to 2-year paybacks in most North American climate zones.

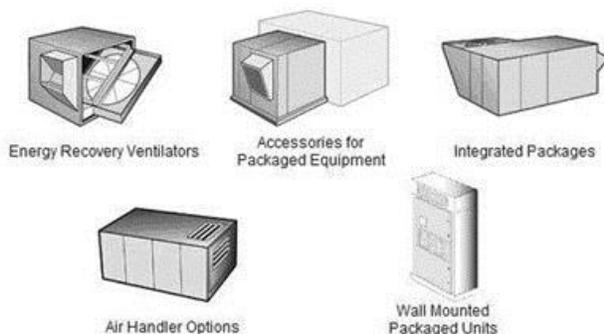
Example: School District Triples Ventilation and Saves Energy

A Florida school district was faced with having to upgrade HVAC systems in five school buildings to meet changing air quality regulations. Upgrading to the revised code would require adding 479 tons of air conditioning to accommodate increased levels of outdoor air.

The district considered installing additional chillers and air handling systems; however, this method was determined to be impractical and costly due to space constraints and the complexity of the retrofit, which meant the project couldn't be completed during school break.

Instead, the district chose a simpler, more energy-efficient and less costly approach: standalone ERVs with energy recovery wheels. The use of ERVs minimized installation costs by utilizing existing ductwork and eliminating the need for additional chillers saving 335kw in peak demand. A 70% reduction in outdoor air energy load saved the district an estimated \$700,000 over 10 years.

Energy Recovery Ventilation System Options



Energy recovery wheels are available from most HVAC OEMs and distributors in a variety of configurations, including:

- **Energy Recovery Ventilators:** Mounted indoors or outdoors. May include heating or cooling to provide neutral air. Ducted separately or tied into existing ductwork.
- **Rooftop Accessories:** Bolt to rooftop units, no roof penetration required.

- Integrated Rooftop Packages: ERV wheel, fans, filters and controls integrated into a standard packaged rooftop unit.
- Air Handler Options: Energy Wheel modules for custom, semi-custom and standard air handler designs enabling a reduction in chiller and boilers size.
- Wall Mounted Packaged Units: Vertically mounted indoor or outdoor units with integrated ERV components.

What to Look for in Energy Recovery Ventilation

1. AHRI-certified: Looking for products that are rated and certified by the Air-Conditioning, Heating and Refrigeration Institute (AHRI) ensures that building owners and engineers design HVAC solutions based on verified performance data
2. 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.
3. 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.
4. 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.
5. Trusted provider: Choose AHRI 1060 performance certified providers to ensure the highest-quality equipment and strong customer service.

Conclusion

The high energy cost of outdoor air ventilation is a pressing issue among building owners eager to save money while providing a clean, healthy building. Energy recovery wheels offer an environmentally friendly solution to cut energy costs, provide fresh outdoor air ventilation and guarantee a high return on investment.

Sources:

- 1 Site-recovered energy is any energy recovered on site and re-used to reduce the demand for new energy.*
- 2 (2011). FlexYourPower. HVAC system.*
- 3 Scott, J. (July 7, 2010). ASHRAE. Standard 90.1: Setting the energy foundation in buildings for 35 years. News release.*
- 4 (November 30, 2009). ASHRAE Standard Project Committee 189.1. Standard for the design of high-performance, green buildings except low-rise residential buildings.*
- 5 EPA, IAQ Design Tools for Schools*

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