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Reducing Building HVAC Costs With Site-Recovered Energy

By: Stephen J. Pargeter

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 for occupant health and comfort.

Large amounts of energy are wasted each day from commercial, institutional and government 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 condition entering outdoor air. Building owners who fail to capture this wasted energy will continue to incur high energy costs, negatively impacting property values, profitability, and the ability to attract tenants with corporate or federally directed energy-efficiency mandates.

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

Important energy efficiency and 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%-60% of commercial building energy, owners are searching for ways to reduce these expenses.

As the nation's largest energy user, the federal government is leading by example, through the Federal Energy Management Program (FEMP). This program promotes energy efficiency through recommendations and incentives for the private sector, as well as through guidelines and mandates for federal agencies. The FEMP mandates ERV systems for federal buildings and recommends these systems be considered for schools and businesses.

Many private 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% and proposed the first “green building” standard in 2009. When formally adopted by building codes, these increased efficiency standards will significantly impact HVAC equipment selection and design.

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 site-generated 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 reduce greenhouse gas emissions.

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 versus energy cost: Studies have proven that outdoor air ventilation creates a healthier work environment. According to the EPA, "Indoor air can be 2-5 times more polluted than outdoor air...[and] that increased amounts of outdoor air supply is generally better for Indoor Air Quality."

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 1980's led to Sick Building Syndrome and multiple indoor air quality complaints and law suits, 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 energy 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 by up to 40% providing 1-3 year paybacks 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.

Benefits of energy recovery wheels

Energy recovery wheels offer many benefits, including:

- Reduce outdoor air energy costs 60%-80%;
- Reduce capital equipment cost by minimizing HVAC design loads;
- Increase outdoor air levels 2-3x 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; and
- Provide instant to two year paybacks in most North American climate zones.

What to look for in energy recovery ventilation

- 1. AHRI-certified:** Products that are rated and certified by the Air-Conditioning, Heating and Refrigeration Institute (AHRI) ensure 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.

Stephen J. Pargeter is VP product engineering, at Airxchange (www.airxchange.com), Rockland, Mass, a manufacturer of energy recovery ventilation (ERV) wheels—components in systems sold by heating, ventilation, and air conditioning OEMs. For more information, contact info@airxchange.com.