RenewAire®
Energy Recovery Ventilation

TAKE A LOAD OFF WITH ENERGY RECOVERY VENTILATION

How to enhance indoor air quality while reducing heating and cooling loads

By Nick Agopian

As buildings become more airtight, the need for better ventilation is increasingly important — especially since Americans spend, on average, 90% of their time indoors. Without proper ventilation, internally generated contaminants accumulate and cause poor indoor air quality (IAQ), resulting in serious health problems. In fact, the U.S. Environmental Protection Agency (EPA) ranks indoor air pollutants among the top-five environmental risks to public health.[1]

Although better ventilation is the best way to enhance IAQ, many building owners — particularly of commercial and multifamily structures — are wary of additional costs that might be incurred. However, those days are in the past as Energy Recovery Ventilation (ERV) systems now operate energy-efficiently and cost-effectively while providing clean, healthy indoor air and generating major energy savings. How is this possible? By reducing heating and cooling loads.

RenewAire ERVs reduced the annual HVAC energy use by 34% at the Hilton Garden Inn located in Dayton South/Austin Landing, Ohio
Image courtesy of hiltongardeninn3.hilton.com

Reducing Heating and Cooling Loads

According to the U.S. Department of Energy (DOE), "Heating and cooling loads are the measure of energy needed to be added or removed by the HVAC system to provide the desired level of comfort."[2] The utility Florida Power & Light (FPL) states that HVAC systems are some of the largest contributors to peak electricity use.[3] Therefore, heating and cooling loads are extremely costly, and even a small efficiency boost can result in substantial energy savings.

How to Reduce Heating and Cooling Loads

How can heating and cooling loads be reduced? The U.S. Small Business Administration (SBA) states that there are several ways: [4]

- Tighten the building shell and add additional insulation.
- Install energy-efficient windows.
- Upgrade lighting systems.
- Reduce solar gain in cooling-dominated climates, and increase solar gain in cold climates.
- Select efficient office equipment and consumer electronics to reduce heat output.
- Lastly, and one of the easiest steps to take: **Control ventilation to improve occupant comfort and save energy.**

Load Reduction via ERV Technology

Let's take a look at the last SBA point above, "Control ventilation to improve occupant comfort and save energy," as a means of reducing heating and cooling loads. One of the most energy-efficient forms of ventilation on the market today is ERV technology. This process recovers otherwise-wasted energy (heat and humidity) contained in the exhaust airstream and transfers it to the fresh air entering through the intake airstream, all with no cross-contamination.[5]

The ability of an ERV system to treat the incoming air with heat and humidity from the outgoing air uses less energy, lowers costs, boosts overall efficiency and results in cleaner indoor air. This method is so effective that both the EPA and the DOE recommend that ERV systems be installed in all buildings. And homeowners are taking notice as well since the 2015 Builder Practices Survey found that whole-house ventilation — such as ERV technology — is now in 27% of single-family detached homes compared to 9% in 2008.[6]

How ERV Technology Reduces Heating and Cooling Loads

Reducing heating and cooling loads can cut energy use and costs, and here is how ERV technology makes load reduction possible:

[1] U.S. Environmental Protection Agency (EPA); Questions About Your Community: Indoor Air; http://www.epa.gov/region1/communities/indoorair.html

[2] U.S. Department of Energy; Strategy Guideline: Accurate Heating and Cooling Load Calculations; http://www.nrel.gov/docs/fy11osti/51603.pdf

[3] FPL; Energy Recovery Ventilation; https://www.fpl.com/business/pdf/erv-primer.pdf

[4] U.S. Small Business Administration (SBA); Energy Efficient Upgrades; https://www.sba.gov/content/hvac-systems#CoolingandHeatingLoadReduction

[5] The assertion of no cross-contamination is based on AHRI Standard 1060

[6] Builder Online; Material World: The Hottest Trends from the 2015 Builder Practices Survey; http://www.builderonline.com/building/building-science/material-world-the-hottest-trends-from-the-2015-builder-practices-survey

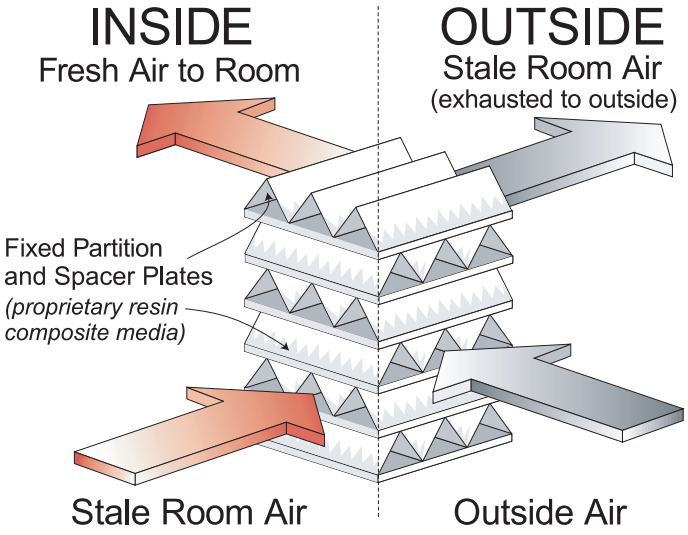
Rooftop units of the Hilton Garden Inn's HVAC system
Image courtesy of Steve Coppock, Habegger Corporation

- **Reduce HVAC energy consumption:** The ability of an ERV system to use otherwise-wasted energy from the exhaust airstream to precondition incoming outdoor air drastically reduces energy consumption. This can lead to energy savings of up to 40% with a payback period of one to three years depending on size and geography. The ERV system will then afford a positive cash flow for the rest of its service life of 20+ years.
- **Downsize HVAC equipment:** Because less energy is being c onsumed, HVAC equipment can be downsized, which in turn further reduces loads.
- **Optimize energy efficiency:** With energy consumption curbed and HVAC equipment downsized, an ERV system boosts overall energy efficiency of the HVAC, leading to additional load reduction.
- **Decrease peak demand and costs:** HVAC systems, especially commercial applications, are busiest during daytime hours, and are thus a main contributor to peak electricity use. An ERV system enables a building to use less power during the times when it's most expensive, resulting in multiplied energy savings via load reduction.

Additional Benefits of ERV Technology as Loads are Reduced

While ERV systems are busy reducing heating and cooling loads, they are also able to realize the following key benefits:

- **Enhance IAQ:** An ERV system is second to none in providing clean, healthy indoor air by removing internally generated contaminants and enhancing IAQ.
- **Strengthen humidity control:** Using energy from outgoing exhaust air to precondition incoming air results in superior humidity control indoors.
- **Meet certification requirements:** An ERV system plays a key role in meeting strict energy-use and sustainability requirements put forth by such organizations as LEED, Green Globes, ENERGY STAR, Passive House, the WELL Building Standard and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), among others.



Not all ERV Systems are Created Equal

When it comes to reducing heating and cooling loads, not all ERV systems are created equal. There are two main types: 1) static core in which there are no moving parts and airstreams are kept physically separate, and 2) wheels that rotate between the exhaust and intake air. They both transfer energy between airstreams, however static-core technology, such as RenewAire's high-efficiency, enthalpic-core, static-plate ERV system, is much more reliable.

Static-Core ERV Technology is Superior to a Wheel System

The following table outlines the key differentiators for why static-core ERV technology is superior to a wheel system in terms of reducing heating and cooling loads:

Reducing Heating and Cooling Loads: Static-Core ERV vs. Wheel ERV		
Key Differentiator	**Superiority of Static-Core ERV**	**Problems with Wheel ERV**
Reliability	With no moving parts to worry about, a static-core ERV system will last for many, many years, which instills confidence in builders, engineers, contractors and building owners alike. For example, the RenewAire static core was designed for a service life of 20+ years and comes with a 10-year mechanical and performance warranty based on the fact that the core has virtually a zero failure rate. This offers peace of mind to consulting engineers when downsizing capital-equipment designs.	The best day of a wheel's life is its first day of operation — and then it's downhill from there. Empirical evidence has shown that wheels are prone to malfunction and the motors burn out. Additionally, wheels have a deposition of desiccant on them to remove water vapor, and when air crosses the desiccant through attrition this causes fine particles to be removed, resulting in a gradual degradation of the system. Therefore, because of the reasons above, as well as the fact that parasitic drive failure can occur and quadrant sections of the wheels can come off alignment, few desiccant-coated wheels are expected to perform optimally for more than 10 years.
HVAC equipment downsizing	Because of the unparalleled reliability of the static core, HVAC equipment can be downsized, resulting in a greater reduction in heating and cooling loads.	Due to the fact that wheels tend to break down, this hampers the ability to downsize the HVAC system's equipment.
Energy efficiency	With greater reliability, less energy expended and less equipment needed, a static-core ERV system will optimize energy efficiency.	Because wheels are prone to break down and the desiccant continues to wear off, the wheel ERV system is less efficient over time in reducing loads, thus making equipment downsizing impossible.
Savings generated	With optimized energy efficiency and less equipment needed, a static-core ERV system can generate sizeable savings by decreasing capital-equipment and energy costs.	With less reliability and efficiency over time, the wheel ERV system generates fewer savings.

In Sum

Poor IAQ is a growing problem that's harming both building structures and occupants, particularly in commercial and multifamily settings. Better ventilation is the best way to enhance IAQ, yet fears of added costs hamper progress. ERV technology is the solution because it provides clean, healthy indoor air while reducing heating and cooling loads. Furthermore, ERV systems decrease the demand on municipal grids and diminish the need for more power plants.

As buildings become more airtight, it's critical to install the best system for the job — and not all ERV technology is created equal. The superior choice is the static-core ERV system, which is the most reliable option for enhancing IAQ energy-efficiently and cost-effectively. Static-core ERV technology is able to remove dangerous internally generated contaminants, while at the same time reducing heating and cooling loads and yielding significant energy savings.

Nick Agopian *is Vice President of Sales and Marketing at* RenewAire*, a pioneer in enhancing indoor air quality in commercial and residential buildings of all sizes through high-efficiency, enthalpic-core, static-plate ERV systems. For more information, visit:* www.renewaire.com*.*