RenewAire
Energy Recovery Ventilation

ERV PRIMER: ENHANCE IAQ & ENERGY SAVINGS IN THE POST-COVID-19 ENVIRONMENT

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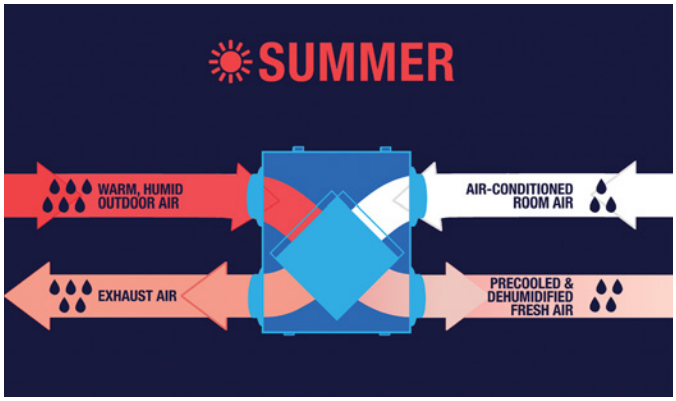
The importance of adequate building ventilation is well known, but it's even more significant in the post-COVID-19 environment. That's because ventilation can remove contaminants from the indoor air, including viruses. Consequently, at RenewAire we're seeing more interest in energy recovery ventilators (ERVs), but many questions exist. This primer seeks to answer the most pressing inquiries and shed light on why ERVs are critical, especially post COVID-19.

What Is an ERV?

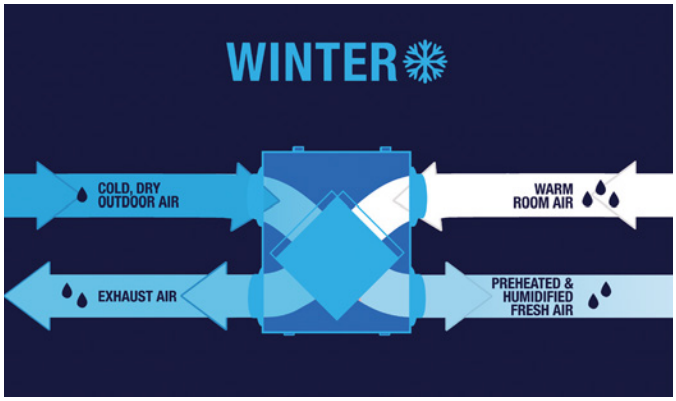
An energy recovery ventilator, or ERV, is a system that employs energy recovery technology, such as a static-plate core or rotating wheel. This process uses balanced airflows and recovers otherwise-expended total energy comprised of heat (sensible energy) and humidity (latent energy).

In summer, warm and humid outside air is precooled and dehumidified via the total energy from the outgoing cool interior air. In winter, cold and dry outside air is preheated and humidified via the total energy from the outgoing warm interior air. Subsequently, less energy is needed for conditioning and ventilation, which means HVAC equipment can be downsized.

Contaminants are exhausted out and clean outdoor air is brought indoors to enhance indoor air quality (IAQ). Energy efficiency is optimized since waste energy is recovered and reused to condition the incoming outdoor air. This makes ERVs the optimal solution for high-level ventilation and energy savings.



In summer, the warm, humid outside air is precooled and dehumidified by the outgoing cool interior air



In winter, the cold, dry outside air is preheated and humidified by the outgoing warm interior air

Figure 1: The process of energy recovery ventilation employed by static-plate core RenewAire ERVs in both warm and cool months.

Why Are ERVs Used?

The quality of indoor air is of utmost importance since it has tremendous impact on the health and wellbeing of occupants. In fact, the U.S. Environmental Protection Agency (EPA) found that indoor air is typically 2-5 times and occasionally 100 times more polluted than outdoor air. The EPA also ranked indoor air pollution among the top-five environmental risks to public health.

Post COVID-19, IAQ is even more imperative because a buildup of indoor virus aerosols can have detrimental outcomes on occupants. It's essential that indoor spaces be well ventilated to protect people's health and safeguard against disease outbreaks. This is particularly true as structures become increasingly air-sealed, which ends up locking in contaminants.

However, proper ventilation requires an investment in energy and HVAC equipment, adding up to substantial installation and operational costs. What's more, post COVID-19, increased ventilation rates are needed for greater dilution of indoor air contaminants to establish healthy spaces. More ventilation means amplified costs.

Yet, the solution to this is not opening a window—as some say—rather, the best option is increased and balanced ventilation via an ERV. Utilizing ERVs creates cleaner and healthier indoor air energy-efficiently, cost-effectively and sustainably. By enhancing IAQ while maximizing energy conservation, occupant health is improved, costs are reduced and the environment is supported.

Finally, since ERVs foster healthy indoor environments with minimal energy expended, they are key in meeting stringent building codes and standards. Indeed, ERVs are required in several of the most rigorous ones to realize greener and higher-performing buildings.

Now that we have a compelling case for the "why" of ERVs, let's look at the practical aspects of their implementation.

Where Are ERVs Used?

ERVs can be used everywhere and in every climate. From the largest commercial building to the smallest residential home—and everything in between. There are ERVs for structures of every type, size and geography. Flexibility is the name of the game, and ERVs can be applied in all commercial, residential, multifamily, hospitality, institutional, healthcare, educational, office, retail, industrial and government buildings.

Figure 2: Common indoor air contaminants that can have adverse health effects on occupants.

How Are ERVs Used?

Many different uses exist for ERVs, such as:

- Standing alone in a residential setting and producing all the healthy indoor air required for a home
- In concert with a complex HVAC system, as a both a standalone or integral component, serving the ventilation needs of larger structures
- In new building applications, as well as in retrofits with existing HVAC equipment

If a home or building of every type and in every climate needs better ventilation, ERVs can be applied. Moreover, balanced ventilation is much more impactful at improving IAQ in homes and buildings compared to other types of ventilation, such as exhaust or supply-only.

What Are the Benefits of Using ERVs?

Utilizing ERVs results in a win-win-win: better health for indoor occupants, decreased costs for building owners and a diminished environmental footprint. Specific benefits include:

- **Enhanced IAQ:** By exhausting out harmful indoor air contaminants—such as volatile organic compounds (VOCs), odors, bacteria and virus aerosols—ERVs create cleaner and healthier indoor air.
- **Healthier and safer indoor spaces post COVID-19:** Research from leading organizations shows that increased building ventilation can mitigate the transmission of COVID-19.[1] Thereby, ERVs can help protect the health and safety of indoor occupants.
- **Peace of mind:** Knowing that ERVs are efficiently removing indoor air contaminants can help occupants feel safer about spending time inside.
- **Reduced energy use:** Because ERVs use otherwise-expended total energy to condition the incoming outdoor air, energy efficiency and savings are boosted. This considerably cuts down on the amount of HVAC energy required for ventilation.
- **Downsized HVAC equipment:** Recovered energy can downsize capital equipment, lower energy consumption and cut costs.
- **Fewer costs:** Costs are minimized because with less energy needed, HVAC equipment can be downsized, thus saving on capital costs and opening up valuable building space. Also, less energy used for ventilation means lower energy costs.
- **Quick payback:** Due to the considerable energy and cost savings generated by ERVs, their payback is quick. The initial investment can be recouped in a couple of years, and then sizable annual energy cost savings will occur for the life of the system.

[1] For sources on this statement, view the white paper, "Mitigate COVID-19 Transmission via Increased Building Ventilation," which is hyperlinked in this sentence.

How Can ERVs Help Meet Strict Building Codes and Standards?

ERVs play a central role in enabling structures of every type to meet strict building codes and standards for sustainability, IAQ, health and energy efficiency. Minimum standards for building codes require ERVs, and higher-level standards also exist that go above and beyond minimum codes. ERVs are pivotal for achieving any code or standard for high-performance structures.

For example, the strictest guideline for energy efficiency is ASHRAE Standard 90.1. Starting in 2010, it required the use of energy recovery based upon a unit's supply airflow, outdoor air percentage, geographic location and hours of operation. The standard mandates the total energy recovery effectiveness (sensible and latent) be a minimum of 50% when required.

In addition, ASHRAE Standard 189.1 provides even more stringent green-building parameters to achieve the most sustainable buildings possible. It addresses site sustainability, water-use efficiency, energy efficiency, indoor environmental quality (IEQ) and the building's overall impact on the atmosphere, materials and resources.

Regarding energy recovery, 189.1 incorporates all of 90.1's requirements and then some. Both standards require ERVs in several instances based on climate zone and percent of outdoor air at full design airflow rate. Where 189.1 goes even further than 90.1 is in requiring ERVs to have a minimum of 60% energy recovery effectiveness.

Since ERVs are so proficient at improving IAQ while optimizing energy efficiency, they're also compulsory in most green-building certifications. These include LEED®, Green Globes, ENERGY STAR, Net Zero, Passive House, PHIUS, Living Building Challenge, HVI, AHRI and WELL Building Standard®, among others. The bottom line is that if you want a green, healthy, energy-efficient home or building, ERVs should be at the core.

What's the Difference Between ERVs and HRVs?

The main difference between an ERV and a heat recovery ventilator (HRV) is right there in the name. An ERV recovers total energy, which includes both heat (sensible energy) and humidity (latent energy), from the exhaust airstream. Whereas, an HRV is restricted to only recovering heat (sensible energy) from the exhaust airstream. Hence, an ERV is more successful and efficient at conditioning outdoor air coming inside and establishing a comfortable indoor environment.

What's the Difference Between Static-Plate Core and Wheel ERVs?

Not all ERVs are created equal. RenewAire's high-efficiency, static-plate, enthalpy-core ERVs utilize a highly developed air-to-air energy-exchange core. Many layers of plates physically separate the airstreams so there's no cross-contamination of the fresh air. The plates are made of an engineered "resin" material that simultaneously transfers heat through conduction and humidity by attracting bound water vapor from one airstream to the other. This is done while moderating extremes in both temperature and humidity.

The other ERV option uses a rotating wheel to transfer energy, and this can be problematic. First, wheel ERVs can suffer from leakage, which cross-contaminates the fresh air. Second, due to so many moving parts, wheel ERVs are more prone to breakdowns. Furthermore, the desiccant material used by wheel ERVs can wear away over time, thus requiring more maintenance. Finally, wheels require parasitic power for motorized rotation, which constantly consumes energy and impairs efficiency.

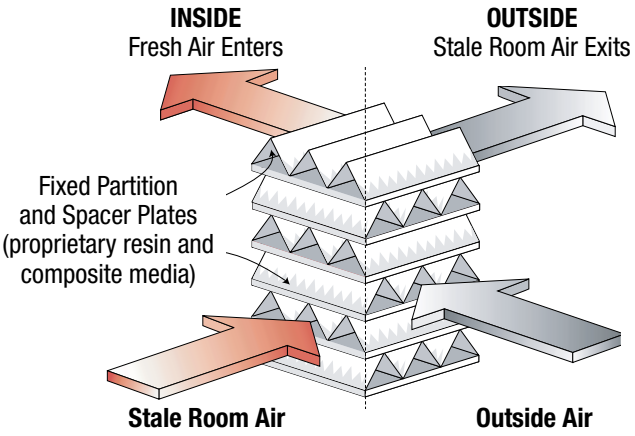


Figure 3: RenewAire's high-efficiency, static-plate, enthalpy-core ERVs utilize a highly developed air-to-air energy-exchange core.

What Role Will ERVs Play in a Post-COVID-19 Environment?

As the world adjusts to a new normal, it's clear that increased building ventilation is a principal element in fighting the Coronavirus and COVID-19. With a higher ventilation rate, more indoor virus particles are exhausted out. But more ventilation heightens energy consumption. Therefore, because ERVs specialize in energy-efficient and effective ventilation, they're indispensable in a post-COVID-19 environment. This is precisely the case for the following reasons:

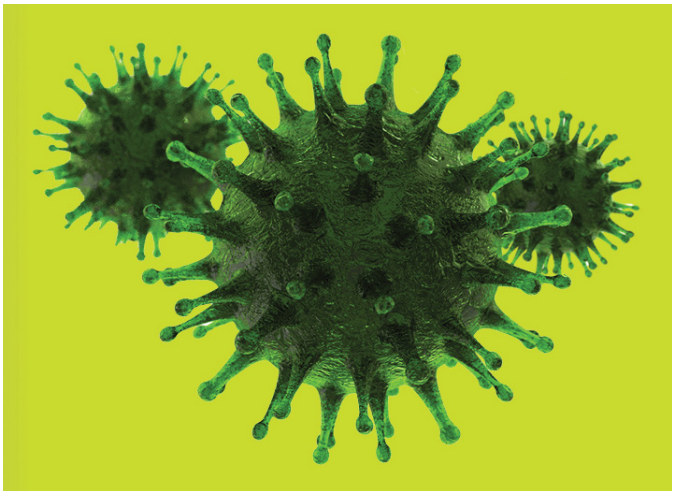


Figure 4: Mitigate transmission of COVID-19 via increased building ventilation with a RenewAire ERV or DOAS.

- **Enhancing IAQ and energy efficiency:** The innovative technology employed by ERVs is the only solution to marry increased airflow—and better IAQ—with lower energy costs. This makes ERVs absolutely vital post COVID-19 for the health of building occupants, not to mention the bottom line.
- **Achieving higher building codes and standards:** To ensure the health and wellbeing of indoor occupants, higher building codes and standards are required. ERVs are required by the most stringent ones since they enhance IAQ and reduce energy use, thus realizing healthy and sustainable homes and buildings.
- **Increasing building ventilation:** Serving as a central pillar in healthier buildings is increased ventilation. Research shows that viruses, including the Coronavirus, can be spread via indoor aerosols. Ventilation is necessary for exhausting such particles outside.
- **Overcoming the energy challenge:** Producing enough ventilation to clean out the indoor air requires a substantial amount of energy. That's where ERVs come to the rescue. The inherent energy efficiency of ERVs counteracts the extra energy required to sufficiently ventilate a space.

Why Are RenewAire ERVs the Best Choice?

In the post-COVID-19 environment, ERVs are crucial due their ability to enhance IAQ while cutting energy use. RenewAire's static-plate, enthalpy-core ERVs are the best choice because of their tremendous efficiency, flexibility, reliability and ease of use. The results are cleaner and healthier indoor air, strengthened protection against airborne pathogens, reduced energy use and bolstered cost savings.

RenewAire also offers Dedicated Outdoor Air Systems (DOAS) with energy recovery as part of its robust line of ventilation products. The DOAS decouples outdoor and indoor air loads, which further reduces ventilation energy use. IAQ, comfort and cost savings are enhanced by efficiently bringing in dehumidified outdoor air and using energy recovery.

Figure 5: RenewAire offers a variety of solutions to maximize IAQ, energy efficiency and cost savings for every home and building. These include the EV Series Premium ERV and DN Series DOAS (left to right).

In Summary

To safeguard occupant health from harmful indoor air contaminants post COVID-19, ERVs are the primary ingredient for enhancing both IAQ and energy savings. Ultimately, ERVs are the best choice for providing increased and balanced ventilation while also cutting energy consumption. ERVs are exactly what structures of every type and size need right now to establish safer indoor environments for their occupants.

For more details on why ERVs are fundamental for enhancing IAQ and energy savings, visit RenewAire's IAQ Matters and COVID-19 Response resource centers.

Nick Agopian *is Vice President, Sales and Marketing at RenewAire. For 35 years, RenewAire has been a pioneer in improving people's health, cognitive function, productivity and wellbeing by enhancing IAQ via energy recovery ventilation technologies. This is done energy-efficiently, cost-effectively and sustainably via fifth-generation, static-plate, enthalpy-core Energy Recovery Ventilators and Dedicated Outdoor Air Systems. For more information, visit: www.renewaire.com.*