AIRXCHANGE

ENERGY RECOVERY BEST PRACTICES DURING PANDEMIC

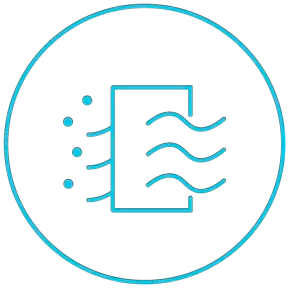
MAY 2020

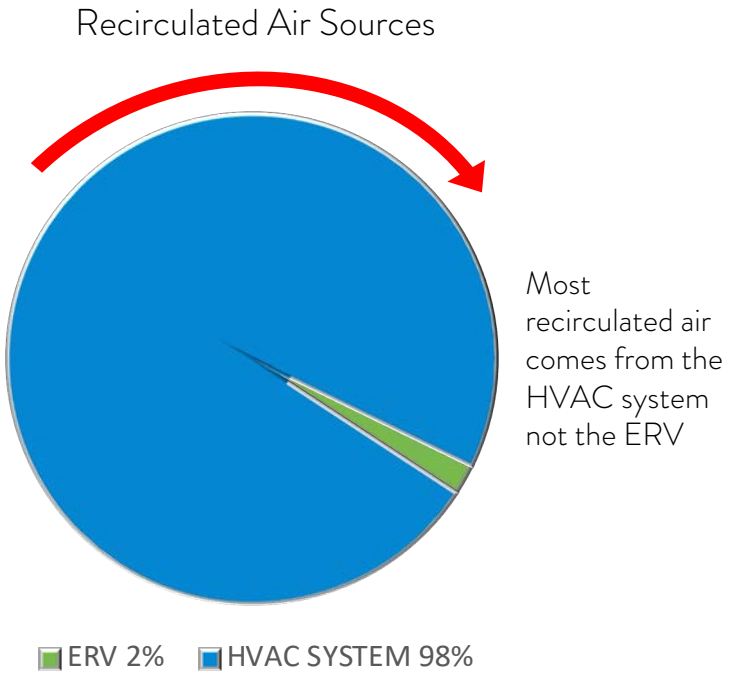
In times of extreme health risk such as the current pandemic, it's helpful to have a good understanding of how outdoor air ventilation systems can reduce the spread of pathogens within the built environment. When ventilation is provided by an energy recovery ventilator (ERV), a further understanding of recirculated air is needed to alleviate concerns for operating ERVs during pandemics.

In well-designed commercial buildings, energy recovery ventilators should remain operating and are essential to maintain ventilation rates, see Safe Use of Heat Recovery Section REVHA guidance April 3, 2020.

With the exception of healthcare facilities, most HVAC systems condition a mix of fresh outdoor air with recirculated room air. Energy recovery ventilators precondition the fresh air and supply it directly to the indoor space or to other downstream systems, such as fan coils, air handlers or rooftop units.

With very low recirculation amounts, ERVs have the least tendency to bring particles and VOC's back into the building as compared to a downstream HVAC system that mixes a portion of fresh air with significant amounts of recirculated air.

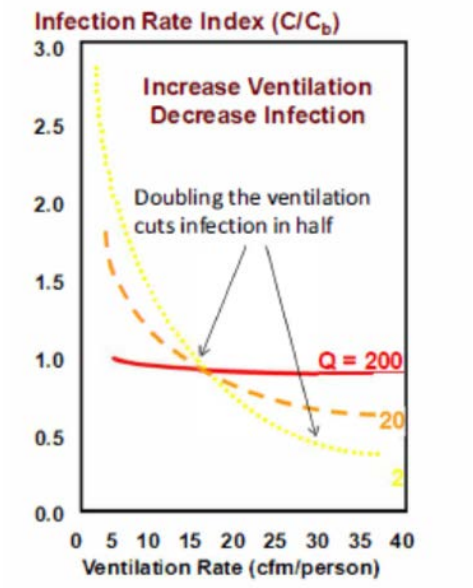




Reducing ERV recirculation rates, known by AHRI 1060 certification as Exhaust Air Transfer Ratio (EATR), is possible by checking actual operation of the ERV. An HVAC or air balancing technician should be able to measure the air pressure at the return air inlet and supply air discharge of the energy recovery component. Best practice is to maintain a higher pressure in the supply air section than the exhaust air section. This will reduce the amount of EATR. With good fan and system design, EATR can be kept under 5% and generally between 1-3%.

Airxchange cautions operators that bypassing or disabling ERV systems without a complete understanding of the system will likely result in unintended consequences such as reduced outdoor ventilation rates or out-of-control indoor humidity conditions which may themselves favor the spread of viruses. The most appropriate adjustment generally would be to continue operation of the ERV component appropriate to climate conditions, and to increase outside air ventilation rates, which is consistent with CDC guidance, REHVA guidance and the ASHRAE Position Documents.

"Even the most robust HVAC system cannot control all airflows and completely prevent dissemination of an infectious aerosol or disease transmission by droplets or aerosols."- ASHRAE Position Document on Infectious Disease 2020.



Exceeding minimum ventilation standards may be the most powerful means to reducing infection rates. Riley and Nardell (1989) present a standard model of airborne infection usually referred to as the Wells-Riley equation. Increasing ventilation rates decreases exposure by diluting air containing infectious particles with infectious-particle free air. Using the Wells-Riley equation, doubling ventilation rates has the potential to reduce infection rates by half.

Rather than bypass energy recovery ventilators, it could be possible to dramatically increase ventilation flow over building code minimum through an ERV while still recovering a significant amount of energy and maintaining humidity control.

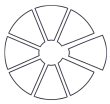
ERV BEST PRACTICE FAQS

Q) Should we keep our existing ERV and ventilation systems in operation?

A) If the total system is designed for recirculated air and a percentage of outdoor air then it should continue to operate in the manner designed. However, if the desire is to increase outdoor air during the crisis and exceed the building code minimum, then the system can support the increase without significant energy penalty or humidity and other load problems if the energy recovery portion of the system is still operating.

Q) In view of the Covid-19, and the small but finite potential for transfer of exhaust air to the supply air side of an energy recovery exchanger, is it safe to operate energy recovery exchangers in conventional commercial spaces, e.g., office, retail, auditoriums, restaurants, and hotels?

A) It is safe to operate energy recovery exchangers in these types of spaces and the benefits of energy savings and enhanced humidity control far outweigh the insignificant risk of increasing the recirculation of any entrained virus. For perspective, bear in mind that most space conditioning equipment recirculates much of the air returned from the occupied space and supplies it back to the occupied space after heating or cooling it. Even where the ERV device allows for exhaust air recapture, this recaptured air will amount to a very small part (e.g. 1 or 2%) of the recirculated air volume.

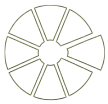


Q) Does ventilation with outside air through ERV devices expose occupants to higher risk of infection?

A) ASHRAE data confirms an effective HVAC system best reduces the likelihood of infection by bacteria/viruses by providing the maximum number of air changes and maintaining space humidity between 40% and 60%., ASHRAE Handbook. Since the primary function of ERVs including energy wheels is to support increased outdoor airflow and space humidity control, and since many systems rely on this recovery to achieve the heating/air conditioning capacity required, turning off the recovery wheels would likely cause more risk to the building occupants than would be avoided.

Q) Is there a simple way to check for proper pressurization of an ERV device to minimize recapture of exhaust air?

A) Systems with ductwork and fans arranged so that the pressures in the exhaust airstream are more negative than those in the supply airstream will prevent recapture. These pressures are easily measured or monitored by the BMS and should be taken in the plenums upstream and downstream of the energy wheel or plate exchanger for both airstreams. As a general recommendation, the air pressure leaving the supply side of the energy recovery device should be at least 0.5 in.wg. higher than the pressure on the exhaust inlet of the energy recovery device. For more details, the owner can contact the manufacturer of the total energy wheel and/or system to quantify the level of carryover that exists when operating at field measured conditions.



Q)What is known as to carry-over of viruses in ERV wheels and plates?

A) Research has been completed to show that the carry-over of bacteria is similar to that measured for other particulate (tobacco smoke), aerosols and tracer gases such as SF6. This research can be generalized to viruses and has shown the carry-over associated with well designed total energy wheel systems to be on par with 95% high efficiency filters.

Q) Can ERV exchangers be cleaned?

A) Yes. Airxchange wheels can be removed from airstream and fully cleaned. Airxchange recommends using a mild nonacid cleaner. A second step to disinfect Airxchange wheels can be added using a 3% mixture of hydrogen peroxide that will kill viruses.

Have questions? Contact us at
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