U.S. Department of Energy - Energy Efficiency and Renewable Energy

Energy Savers

Energy Recovery Ventilation Systems

Energy recovery ventilation systems provide a controlled way of ventilating a home while minimizing energy loss. They reduce the costs of heating ventilated air in the winter by transferring heat from the warm inside air being exhausted to the fresh (but cold) supply air. In the summer, the inside air cools the warmer supply air to reduce ventilation cooling costs.

Types of Systems

There are two types of energy-recovery systems: heat-recovery ventilators (HRV) and energy-recovery (or enthalpy-recovery) ventilators (ERV). Both types include a heat exchanger, one or more fans to push air through the machine, and some controls. There are some small wall- or window-mounted models, but the majority are central, whole-house ventilation systems with their own duct system or shared ductwork.

The main difference between a heat-recovery and an energy-recovery ventilator is the way the heat exchanger works. With an energy-recovery ventilator, the heat exchanger transfers a certain amount of water vapor along with heat energy, while a heat-recovery ventilator only transfers heat.

Because an energy-recovery ventilator transfers some of the moisture from the exhaust air to the usually less humid incoming winter air, the humidity of the house air stays more constant. This also keeps the heat exchanger core warmer, minimizing problems with freezing.

In the summer, an energy-recovery ventilator may help to control humidity in the house by transferring some of the water vapor in the incoming air to the theoretically drier air that's leaving the house. If you use an air conditioner, an energy-recovery ventilator generally offers better humidity control than a heat-recovery system. However, there's some controversy about using ventilation systems at all during humid, but not overly hot, summer weather. Some experts suggest that it is better to turn the system off in very humid weather to keep indoor humidity levels low. You can also set up the system so that it only runs when the air conditioning system is running, or use pre-cooling coils.

Most energy recovery ventilation systems can recover about 70%–80% of the energy in the exiting air and deliver that energy to the incoming air. However, they are most cost effective in climates with extreme winters or summers, and where fuel costs are high. In mild climates, the cost of the additional electricity consumed by the system fans may exceed the energy savings from not having to condition the supply air.

Installation and Maintenance

Energy recovery ventilation systems usually cost more to install than other ventilation systems. In general, simplicity is key to a cost-effective installation. To save on installation costs, many systems share existing ductwork. Complex systems are not only more expensive to install, but they are generally more maintenance intensive and often consume more electric power. For most houses, attempting to recover all of the energy in the exhaust air will probably not be worth the additional cost. Also, these types of ventilation systems are still not very common. Only some HVAC contractors have enough technical expertise and experience to install them.

In general, you want to have a supply and return duct for each bedroom and for each common living area. Duct runs should be as short and straight as possible. The correct size duct is necessary to minimize pressure drops in the system and thus improve performance. Insulate ducts located in unheated spaces, and seal all joints with duct mastic (never use ordinary duct tape on ducts.)

Also, energy recovery ventilation systems operated in cold climates must have devices to help prevent freezing and frost formation. Very cold supply air can cause frost formation in the heat exchanger, which can damage it. Frost buildup also reduces ventilation effectiveness.

Energy recovery ventilation systems require more maintenance than other ventilation systems. They need to be cleaned regularly to prevent deterioration of ventilation rates and heat recovery, and to prevent mold and bacteria on heat exchanger surfaces.

Learn More

Financing & Incentives

- Find Federal Tax Credits for Energy Efficiency
  Energy Savers

Product Information

- Product & Service Directory
  American Society of Heating, Refrigerating and Air-Conditioning Engineers

Professional Services

- Contractor Locator
  Air Conditioning Contractors of America
- Find a Contractor
  Plumbing-Heating-Cooling Contractors Association

Related Links

- Energy Recovery Ventilator
  A Sourcebook for Green and Sustainable Building
- Common Questions about Heat and Energy Recovery Ventilators
  University of Minnesota Extension Service
- Heat/Energy Recovery Ventilators
  Toolbase Services

Reading List

- *Whole-House Ventilation* (PDF 399 KB). (December 2002). DOE/GO-102002-0778.
  U.S. Department of Energy.