BUILDING SERVICES MANAGEMENT

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For and from HVAC Systems

Energy Exchange between Exhaust and Fresh Air

Buildings account for 35 to 40 percent of total energy consumption worldwide, according to the Department of Energy.

Commercial buildings, in particular consume large amounts of energy related to heating/ventilation/air conditioning (HVAC), lighting, water heating, and other building systems.

Efforts to reduce energy consumption and greenhouse gas emissions have led to increasing deployments of energy efficiency retrofits for commercial and public buildings. According to a new report from Navigant Research, the worldwide market for energy efficiency retrofits in commercial and public buildings will grow from $68.2 billion in 2014 to $127.5 billion by 2023.

“Because the existing building stock dwarfs the amount of new building space being added on an annual basis, energy efficiency retrofits are a critical pathway to greening the world’s commercial buildings,” says Eric Bloom, principal research analyst with Navigant Research.

“There’s a big opportunity for improving energy efficiency in existing buildings’ HVAC systems,” said Randy Steele, VP and general manger of Airxchange, a manufacturer of a line of energy recovery wheels designed for field installation.

Energy Recovery Ventilation is the energy recovery process by which energy contained in stale exhaust air is used to pre-condition fresh air supplies in HVAC systems.

Steele said, energy recovery wheel technology reduces energy requirements for heating or cooling outdoor air by up to 80 percent and is available from most HVAC manufacturers in a variety of configurations.

A recent study conducted for the U.S. Department of Energy estimates that wide spread use of Energy recovery Ventilation can save up to .55 quads of energy annually by recycling energy otherwise wasted in building exhaust air.

An ERV is a type of air-to-air heat exchanger that not only transfers sensible heat but also latent heat. ERVs are especially recommended in climates where cooling loads place strong demands on HVAC systems. They transfer moisture from the humid air stream (incoming out-door air in the summer) to the exhaust air stream. In some cases, ERVs may be suitable in climates with very cold winters. If indoor

relative humidity tends to be too low, what available moisture there is in the indoor exhaust air stream is transferred to incoming outdoor air.

By recycling 70 to 80 percent of the total energy contained in the exhaust air, energy recovery wheels lower total HVAC energy usage.

Energy recovery wheels offer a highly efficient alternative to condition the out-door air as compared to a typical vapor compression system. Combining the two technologies can increase your total system efficiency, said Steele. “Existing technologies have reached their maximum efficiencies,” adding that the technologies are now being combined to increase efficiencies.

Shifting the outdoor air ventilation load to the wheel reduces the demand on traditional HVAC equipment, allowing the now smaller, wheel-based HVAC equipment to operate more efficiently.

Energy Recovery Ventilators are an integral part of modern commercial HVAC systems, allowing for low energy costs while not compromising the desire for a comfortable environment.

As part of its “IAQ Design Tools for Schools” program, the EPA says indoor air can be 2 to 5 times more polluted than out-door air; therefore, most HVAC system designers understand that increased amounts of outdoor air supply is generally better for IAQ. Yet there are concerns over the implications that this added amount of outdoor air supply has on the operating cost of the HVAC system, as well as moisture control for the building (too wet or too dry).

As a result, school designers often try to reduce the amount of outdoor air equal to – or even below – 15 cubic feet per minute (cfm) of outside air per person, the minimum for school classrooms, as established by the American Heating, Refrigerating and Air-conditioning Engineers (ASHRAE).

Energy costs, and moisture control do not have to be at odds with good IAQ. Energy recovery ventilation equipment can make the negative implications of 15 cfm, while retaining the IAQ advantage of 15 cfm. This approach has been proven in many schools in various regions east of the Rockies, where advanced HVAC systems cost roughly the same as conventional systems, yet provide significant operating cost savings and IAQ advantages.

The incorporation of ERV reduces the peak heating and cooling loads that must be met by the HVAC equipment, and this allows some capital cost reduction due to HVAC equipment downsizing. In some equipment configurations, the installation of an ERV system can also eliminate the need for a building exhaust fan, which will also provide capital cost savings.

ERV systems can also provide annual energy savings by reducing the amount of HVAC energy that is needed to condition the outdoor ventilation air, however, there are inefficiencies and pressure losses

associated with ERV systems that reduce the overall operating savings. In some cases ERV systems may require additional maintenance beyond that required for the baseline HVAC system.

When the time comes to replace or install energy recovery wheels in commercial HVAC units, facility mangers, building owners and engineers face installation challenges including limited access areas, bulky components and complex assemblies.

To eliminate these barriers and facilitate a successful, hassle-free installation, Airxchange designed its line of energy recovery wheels specifically for field installation. Field assembled kits are easily handled by two people and fit through all standard doorways and stairwells. The convenient, transportable design avoids the need for special access openings and eliminates excess material handling and installation costs. Airxchange provides same-day assembly, installation and testing of each energy recovery wheel.

“Many times the original equipment manufacturer is no longer in business which presents an extra hoop for facility mangers to jump through,” said Steel.

Meanwhile, advancing ERV technology bridges the gap between healthy indoor environments and energy consumption.