AIRXCHANGE

COMPARING HEAT PIPES WITH ENTHALPY WHEELS

Levels of outdoor air ventilation required to meet Federal and State building codes add substantially to the cooling load of buildings located in hot, humid climates. The largest part of this increased load is the latent (moisture removal) load of the moist outdoor air.

Energy recovery ventilators (ERV's), employing enthalpy wheels that exchange both heat and moisture between outdoor supply air and building exhaust air, represent an ideal way to handle this increased outdoor air requirement. ERV's remove heat and moisture from the incoming airstream before it reaches the HVAC system or the building. The outdoor air load imposed on the air conditioning (A/C) system can be reduced to only 20% of what it would be without the energy recovery ventilation component.

It is important to use an ERV which provides moisture transfer between air streams, since about 2/3 of the outdoor air load is latent load (moisture). ERV's employing fixed plate, run around loop or heat pipe air-to-air heat exchangers will not handle this latent load. Studies at the Florida Solar Energy Center have demonstrated that the rotary wheel ERV is the optimum solution for managing the outdoor air loads of ASHRAE 62-1999 and the codes.

Another approach receiving increased attention in hot, humid climates is the use of a heat pipe regenerator to increase the latent heat removal ratio of cooling coils. In this application a pair of heat pipe heat exchanger coils are placed in the return air duct and supply air duct of an air conditioning system so that the return air is cooled slightly before reaching the evaporator coil of the A/C system and the air leaving the evaporator coil is heated slightly before delivery to the conditioned space. This device increases the moisture removal capability of the A/C system by lowering the apparatus dewpoint temperature (effectively lowering the sensible heat ratio of the coil).

Heat pipes enhance the ability of a given piece of air conditioning equipment to remove additional moisture resulting from increased outdoor air ventilation and is sometimes referred to as "free" reheat. However, these systems are not free. The lower evaporation pressure and associated increased static pressure loss of the heat pipe increases the electric power usage of the air conditioning compressor and fans. This application of heat pipe technology does not recover energy.

By contrast, the ERV maintains comfort while reducing energy use and shrinking equipment size. Packaged equipment fan sizes are smaller and cooling tonnage is reduced by up to 4 tons per 1000 CFM of outside air. While the heat pipe can enhance the latent performance of an air conditioning system, the ERV can achieve the similar results with additional benefits. Only the ERV can be demonstrated to pay for itself.