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ConsERV™

Moisture Transfer Membrane in an Energy Recovery Ventilator

Nano-Structured Polymer Technology

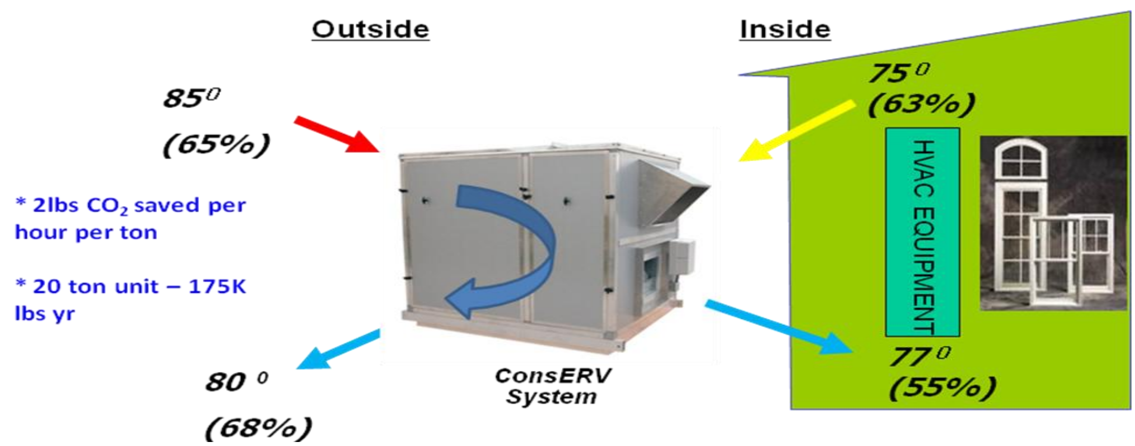
The ConsERV product gets its special attributes from Dais Analytic's high dielectric membrane material which is made from a number of commercially available polymer resins.

The polymer is chemically modified making it a hydrophilic electrolyte which is an organic/in-organic material. A hydrophilic electrolyte is a substance which contains charged ions and absorbs water in both the vapor and liquid states.

The hydrophlic polymer electrolyte is then cast into a thin membrane using conventional solvent membrane casting technology.

How Does It Function?

Once in the membrane form, the membrane material will absorb (take-in) and desorb (release) water molecules efficiently; with little or no expenditure of energy, and no moving parts.



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If air streams of differing water vapor density are placed in contact with the membrane, it will absorb water from the higher water vapor density stream and desorb water into the lower water vapor density stream.

This activity transfers water vapor (latent heat) from the wet stream to the dry stream.

Simultaneously, membrane structure transfers the thermal energy (sensible heat) from the higher temperature air stream to the lower temperature air stream.

Latent Heat Transfer within the Membrane

The nano-structure polymer resin is made from styrene and other olefin monomers. The sulphonated chain consists of hydrophilic areas, where the styrene has had an acid group added, and the other olefin is a rubbery hydrophobic area.

The hydrophilic areas and hydrophobic areas of chain associate during the casting processes to form phases within the membrane. These phases touch each other and a path can be traced from one face of the membrane to the other. The hydrophilic phases form acidic channels which readily absorb and desorb water. The basis of water transport within the hydrophilic phases is the equalization of water concentration among the phases along with the minimization of electrostatic repulsive forces between the acid groups within the phase. The water will under diffuse from phase to phase based on concentration differences between the phases and equalize within a phase based charge distribution.

The absorption and desorption into the phases has been given the term capillary condensation and capillary evaporation. Operationally it is important to note there is no liquid water present outside of the hydrophilic phases at any time.

Sensible Heat Transfer across the Membrane

The thermal conductivity of the dry polymer resin is approximately .35 W/m-K. The thermal conductivity of water is approximately .598 W/m-K at 293 K. Therefore the thermal conductivity of polymer membrane is between these two extremes.

The membrane thickness is approximately .000020 meter so it does not impede the transfer of sensible energy.

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The air-flow boundary layers, present in the laminar flow within the core, will contribute more sensible thermal resistance than the membrane itself.

Optimization of Sensible and Latent Heat Transfer within the ConsERV™ Core

The flow within the core and spacing between the layers are the two most important variables that determine the effectiveness of the core made from DAC's polymeric membrane.

A counter-flow air pattern within the ConsERV™ is the most efficient both sensible and latent transfer.

Closer layer spacing allows greater sensible and latent transfer by shortening the diffusion distance to the membrane. But closer spacing increases the pressure drop within the product thus effecting overall HVAC system effectiveness.

ConsERV's success is to achieve a high level of total performance (latent and sensible transfer) with as small a pressure drop as possible in a form factor which is simple and durable at a price point which is extraordinarily compelling to the end-user or specifying technical community.

Further questions? Please contact David Longacre, Vice President of Marketing on (727) 375-8484 ext. 211 or by E-mail at david.longacre@conserv.com.