

# Energy recovery wheels for energy efficient IAQ



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# What is Indoor Air Quality ?

- **Indoor Air Quality (IAQ)** refers to the **nature of the conditioned (heat / cool) air** that circulates throughout space/area where we work and live i.e. the air we breathe during most of our lives.
- **A Common MYTH** – Air pollution occurs **only outdoors or in industrial environment**.
- **TRUTH!!** – Air inside conditioned space can be substantially **more polluted than outdoor air**.

**On an average, we spend approximately 90% of our time indoors**

# Ventilation

**The Solution to Pollution is Dilution**

**i.e.**

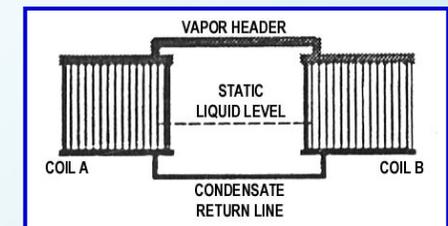
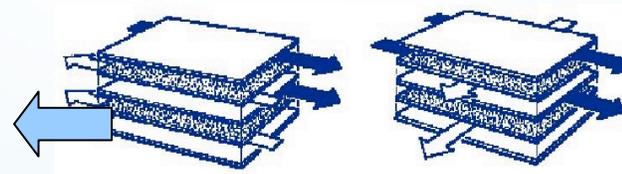
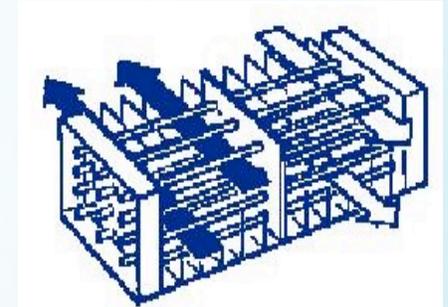
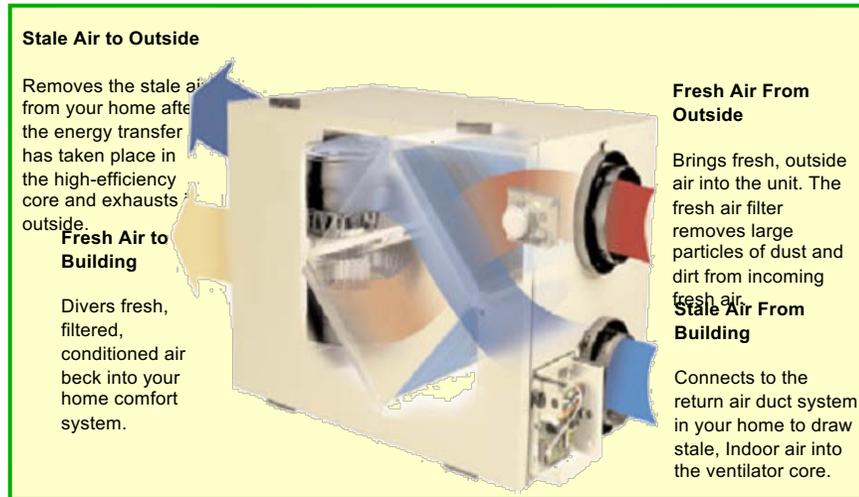
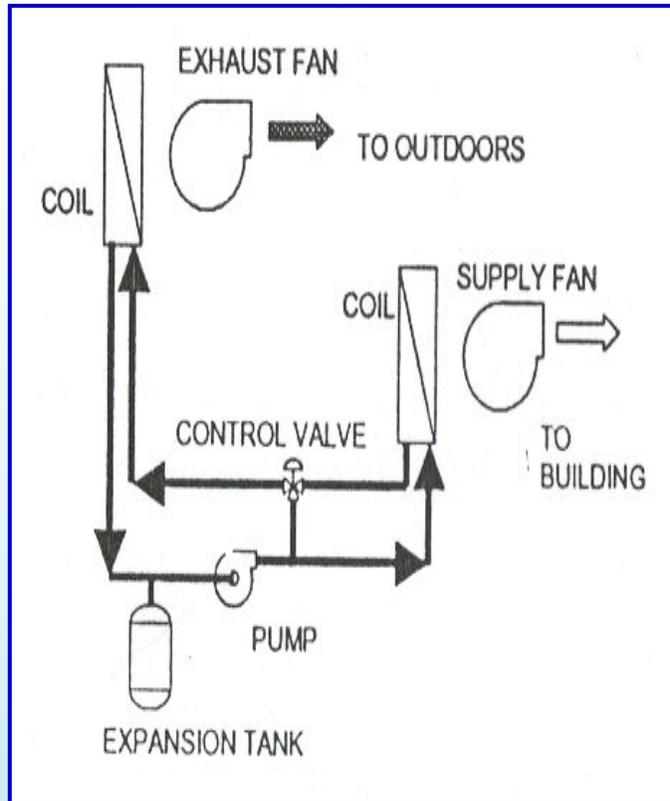
**Bring in fresh Outdoor Air  
to flush out stale Indoor Air**

## **The challenge**

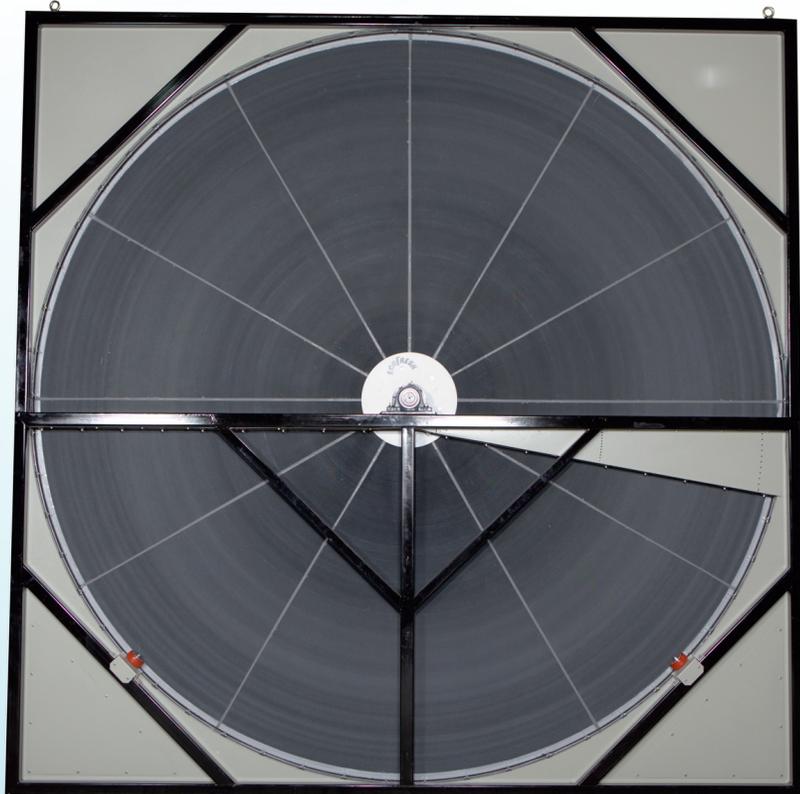
- **Improved indoor environment**
- **Higher utility bills**
- **RH control**

**Energy Recovery  
Devices**

# Heat Exchangers



# Total Energy Recovery Wheels



3Å  
Molecular  
Sieve Coated



# What is Energy Recovery?

- Energy Recovery in Buildings is the **process of recovering the cooling / heating energy from the waste exhaust of the building**. The exhaust air could be mechanically exhausted or getting leaked from the building
- The above is achieved by using **Heat Exchangers** which **exchanges heat** between **Incoming Outdoor Air & Waste Exhaust Air**

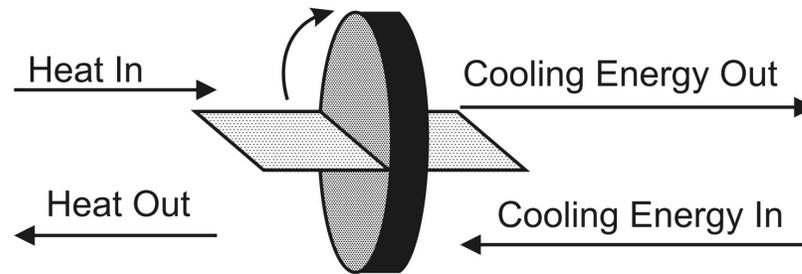
# What is Total Energy Recovery?

$$\text{Total Energy} = \text{Sensible Heat (Temperature)} + \text{Latent Heat (Moisture)}$$

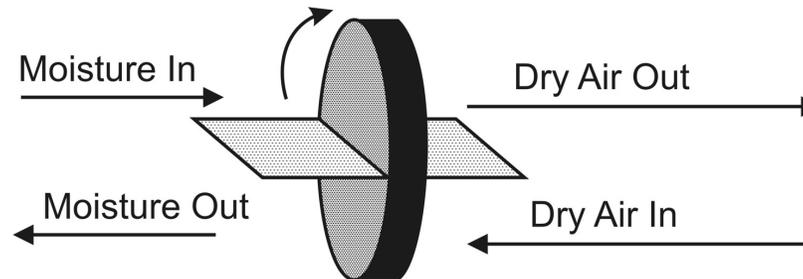
- Can significantly **reduce Energy impact of ventilation**
- As potential first **cost savings** due to reduction in required cooling and heating capacity
- **Improved latent performance** for packaged equipment

# Universal Rules of Total Energy Wheels

**1. Heating/Cooling Energy (e.g. 80%) Is Always Returned To Where It Came From**

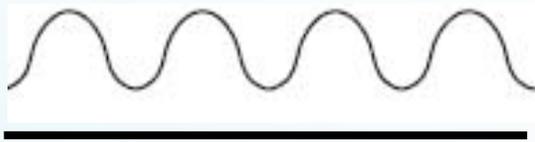


**2. Moisture and Dry Air (e.g. 80%) Is Always Returned To Where It Came From**



# Basic Wheel Construction: Materials

Alternate Layers of Corrugated and Flat Sheets are Bonded and Rolled together to Form A Wheel



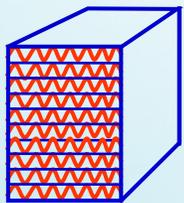
### Substrate

1. Thickness (gsm)
2. Specific Heat
3. Specific Gravity

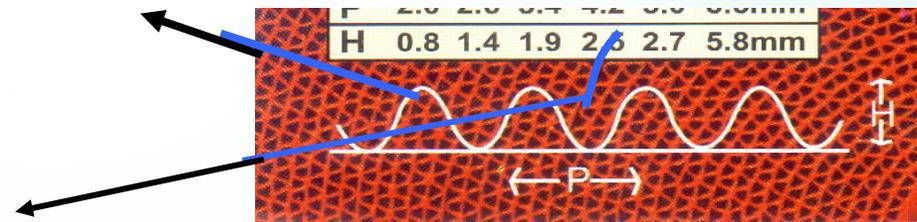
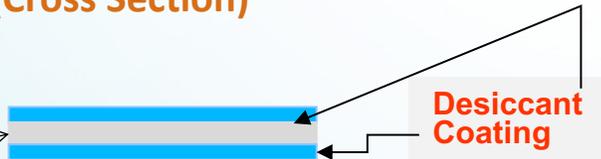
**Energy Recovery Wheel = Substrate + Desiccant Coating**

(core material or media) (Adsorbent)

**Composition of Each Layer (Cross Section)**



Substrate



### Flute Geometry

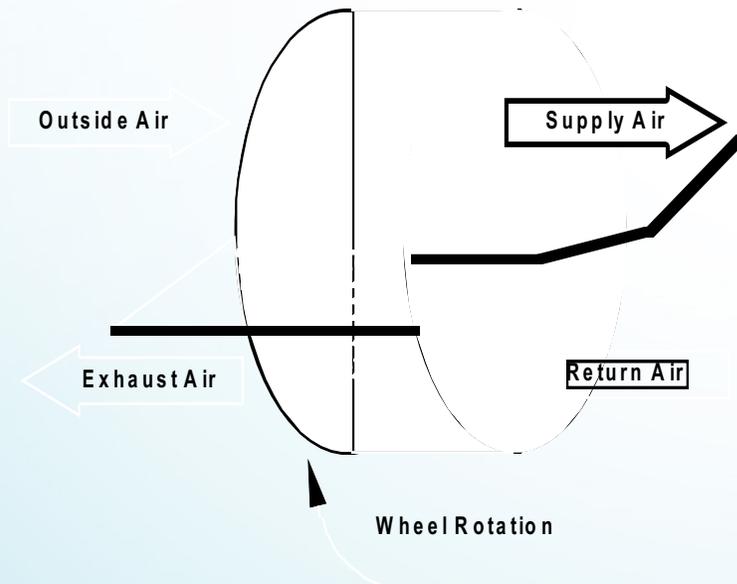
p-pitch  
h-height  
d-depth

### Coating

1. Thickness (gsm)
2. Isotherm
3. Heat of adsorption
4. Heat Capacity

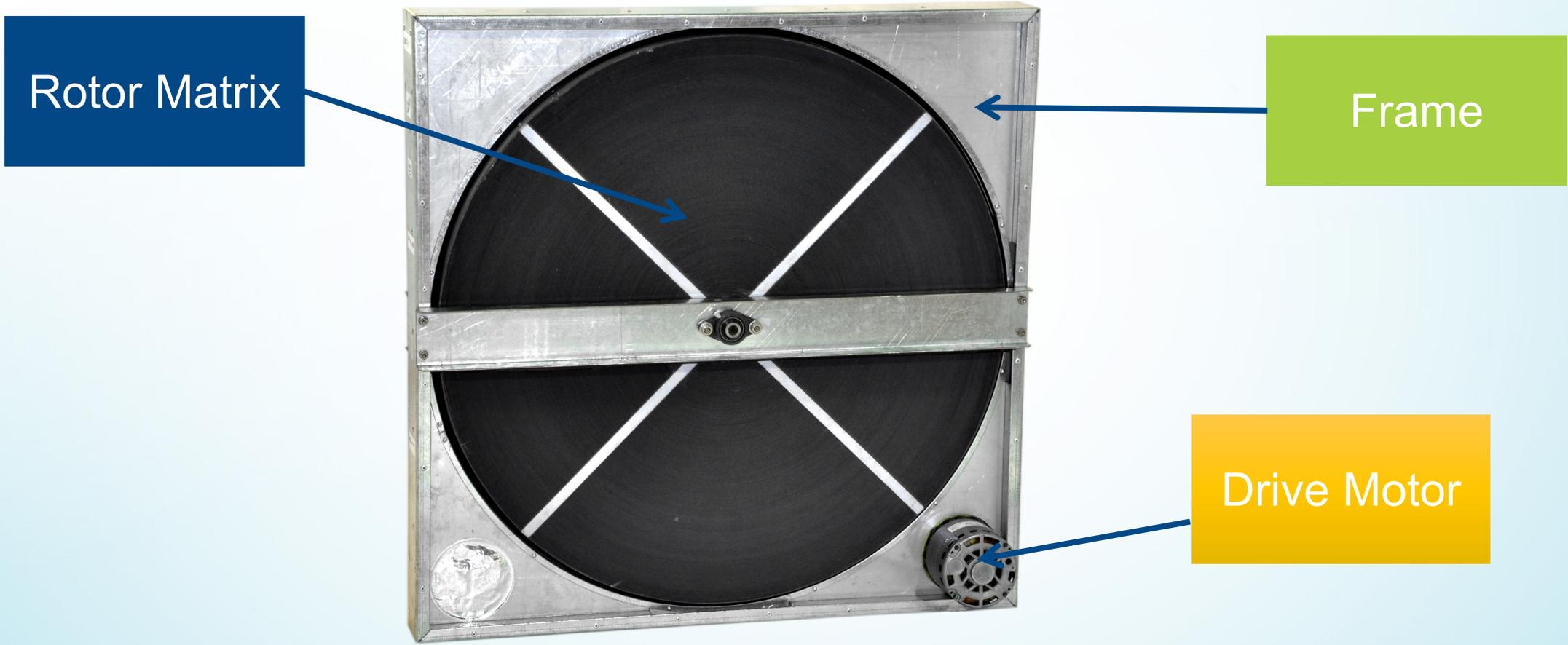
# Illustration of Wheel Purge Section

**Theory of Operation – A specific volume of air is allowed to bypass into exhaust air stream, minimizing carryover of contaminants from return air.**

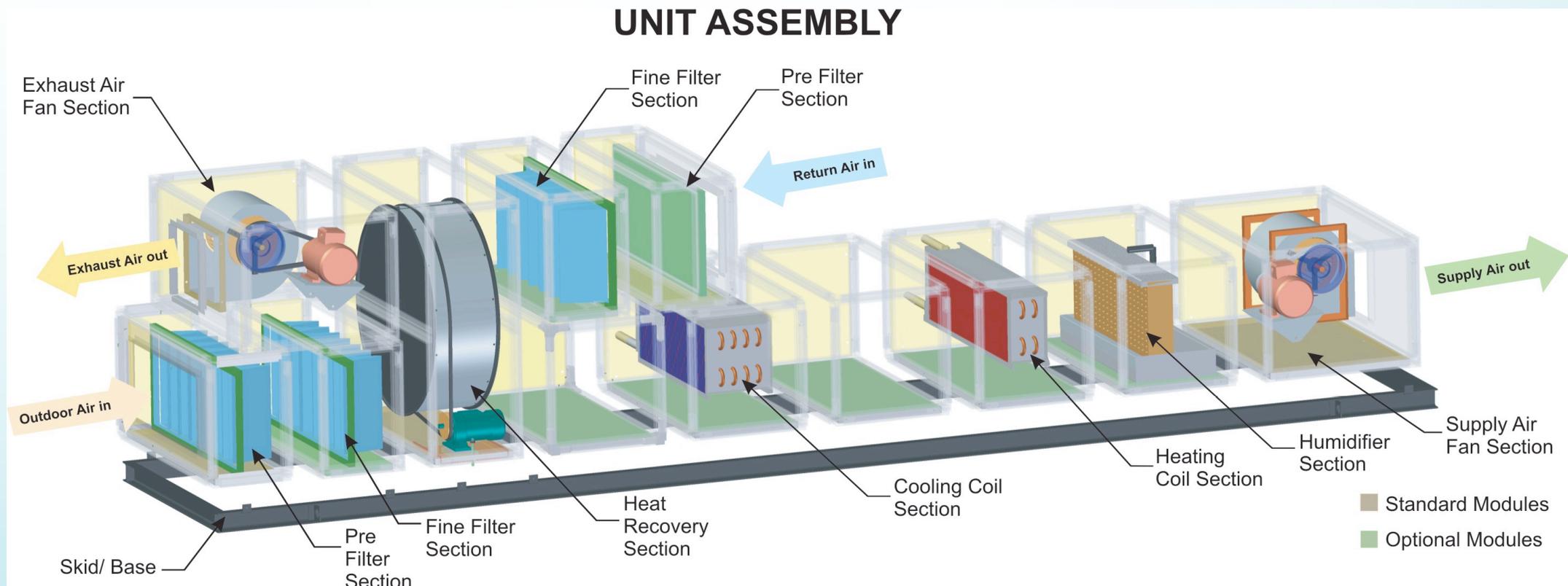


Purge angle is a function of air velocity, and purge volume is a function of wheel volume and rotation speed.

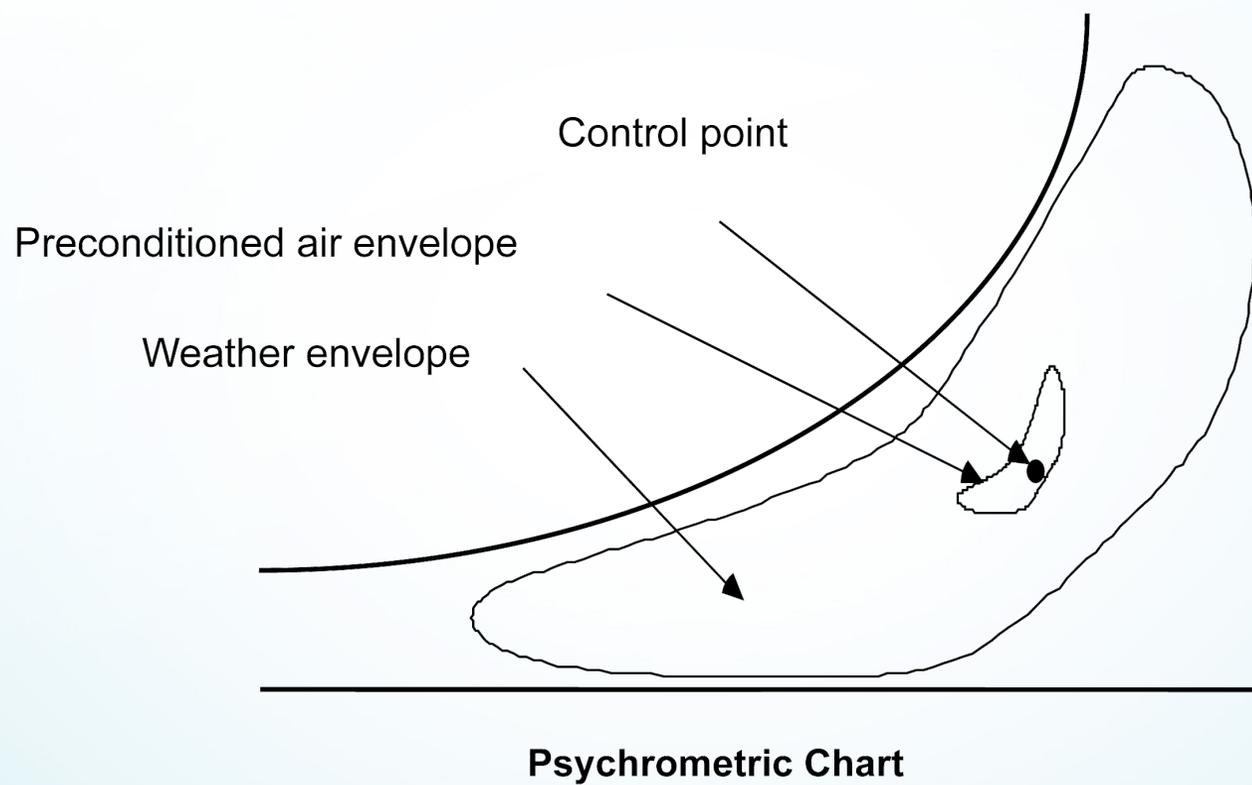
# Energy Recovery Wheel



# Treated Fresh Air Unit Assembly



# What Total Energy Recovery does



# Certified Performance Items

The following performance items shall be certified

<b>Under standard conditions</b> <b>(20°C, 50% rel. Humidity and 1.013 105 Pa – or 1.20 kg/m3)</b>	
Airflow	Outdoor Air Correction Factor
Pressure drop	Exhaust Air Transfer ratio
<b>Under “regular” winter conditions for all RHEs</b>	
Temperature efficiency	Humidity efficiency
<b>Under “regular” summer conditions for Enthlapy and Sorption RHEs</b>	
Temperature efficiency	Humidity efficiency

# Certifications



# DOAS Dual Wheel Concept



Special Dual Sensors

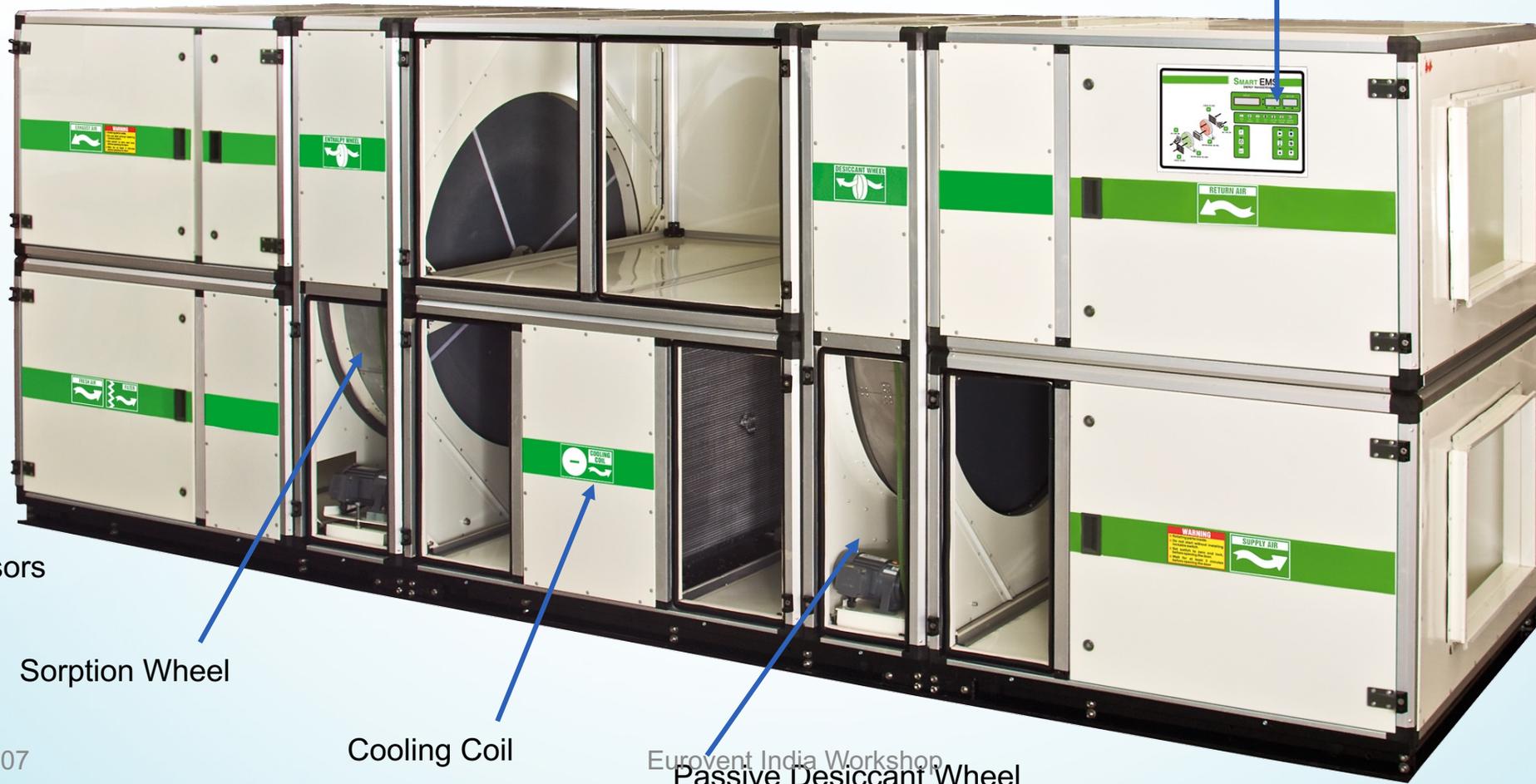
Sorption Wheel

Cooling Coil

Condensing Wheel

# DOAS Dual Wheel Concept

**SMART EMS**  
(Energy Management System)



Special Dual Sensors

Sorption Wheel

Cooling Coil

Passive Desiccant Wheel

# THANK YOU

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