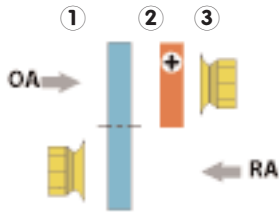


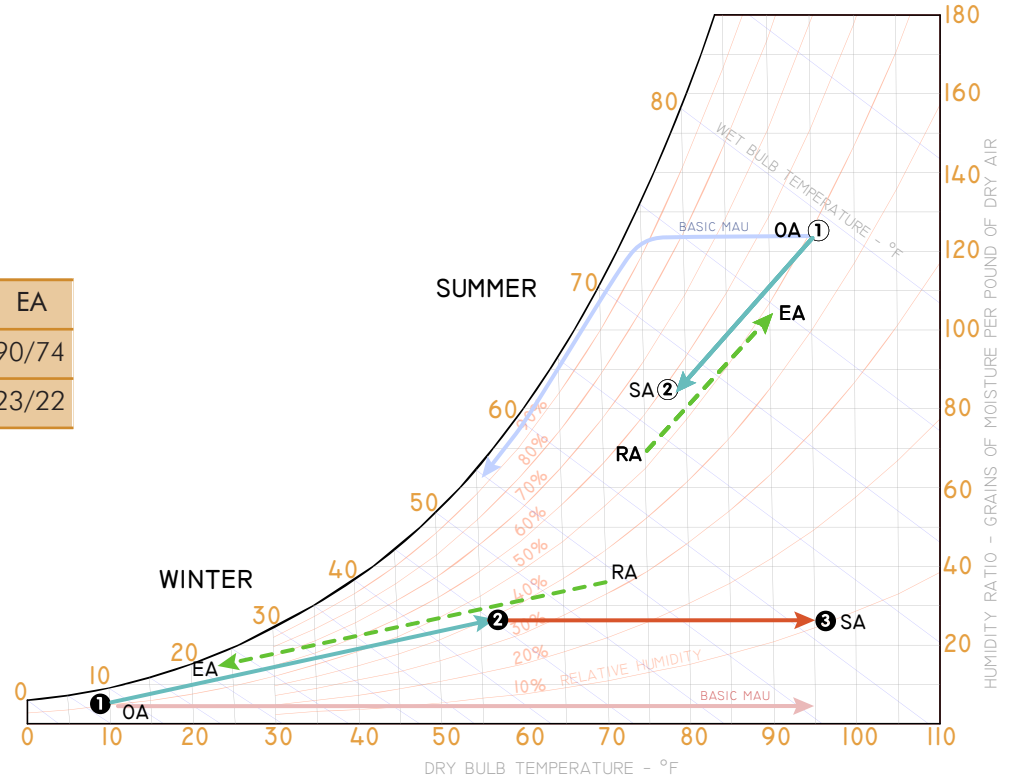
Process Sheet

Wheel Unit with Heating

This page shows a psychrometric process for a typical 100% outdoor air energy recovery unit under standard design conditions. The numbers indicate different stages in the process where there is a transformation of the incoming air condition. The process is compared to the energy needed to achieve the same supply conditions with a basic heating and/or cooling makeup air unit.



| | ① | ② | ③ | RA | EA |
|---|-------|-------|-------|-------|-------|
| S | 95/78 | 80/68 | - | 75/63 | 90/74 |
| W | 10/8 | 56/44 | 95/61 | 70/53 | 23/22 |



Process Calculation (per 1000 cfm)

Summer Operation

Wheel effectiveness 75%

The wheel pre-conditions the air reaching the rooftop unit by cooling it and absorbing moisture. The air entering the cooling coil is at a closer temperature and humidity level to the desired room air, thereby requiring less mechanical cooling and dehumidification. As a result, the cooling coil can be downsized compared to a no-recovery process.

①-② pre-cool section

$$Q_t = 4.5 \times 1000 \times (41.4 - 32.4) = 40.5 \text{ mbh (3.4 tons)}$$

Winter Operation

Wheel effectiveness 70%

The wheel pre-conditions the air reaching the heating coil by heating it and adding moisture. The air entering the heating coil is at a closer temperature and humidity level to the desired room air, thereby requiring less mechanical heating and humidification. As a result, the heating coil can be downsized compared to a no-recovery process.

①-② pre-heat section

$$Q_s = 1.08 \times 1000 \times (56 - 10) = 49.7 \text{ mbh}$$

humidification

$$\dot{m} = 1000 \times 4.5 \times (24 - 6) / 7000 = 11.5 \text{ lbs/hr}$$

②-③ mechanical heating

$$Q_s = 1.08 \times 1000 \times (95 - 56) = 42.1 \text{ mbh}$$

Savings gained by energy recovery

cooling : 3.4 tons/1000 cfm

heating : 49.7 mbh/1000 cfm

humidification: 11.5 lbs/hr

Energy required without energy recovery

cooling: 6.8 tons/1000 cfm

heating : 91.8 mbh/1000 cfm

reheat: 16.2 mbh

humidification: 16.7 lbs/hr