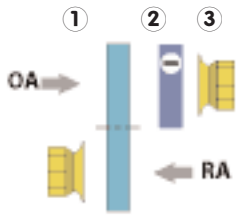


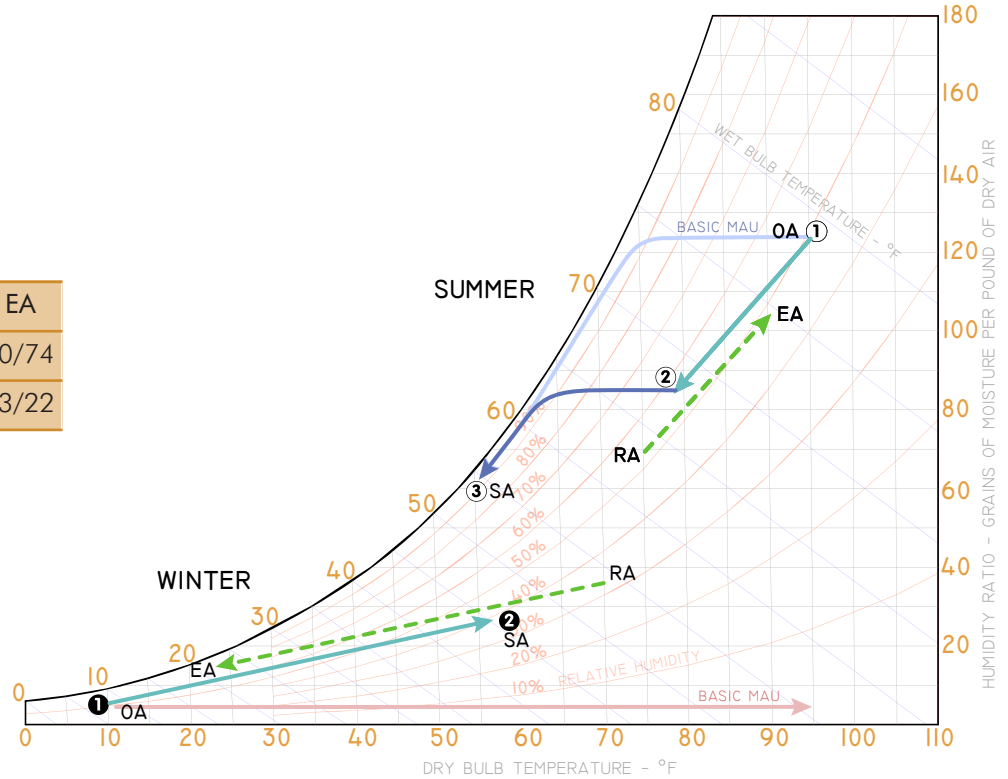
Process Sheet

Wheel Unit with Cooling

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 | 55/55 | 75/63 | 90/74 |
| W | 10/8 | 56/44 | - | 70/53 | 23/22 |



Process Calculation (per 1000 cfm)

Summer Operation

Wheel effectiveness 75%

The wheel pre-conditions the air reaching the cooling coil 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
 $Q_t = 4.5 \times 1000 \times (41.4 - 32.4) = 40.5$ mbh (3.4 tons)
- ②-③ mechanical cooling
 $Q_t = 4.5 \times 1000 \times (32.4 - 23.2) = 41.4$ mbh (3.4 tons)

Winter Operation

Wheel effectiveness 70%

The wheel pre-conditions the air reaching the rooftop unit 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 can be downsized compared to a no-recovery process.

- ①-② pre-heat section
 $Q_s = 1.08 \times 1000 \times (56 - 10) = 49.7$ mbh
- humidification
 $\dot{m} = 1000 \times 4.5 \times (24 - 6) / 7000 = 11.5$ lbs/hr

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 |