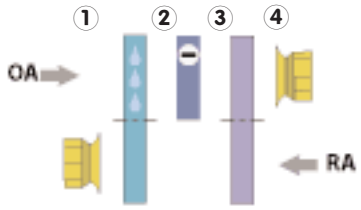
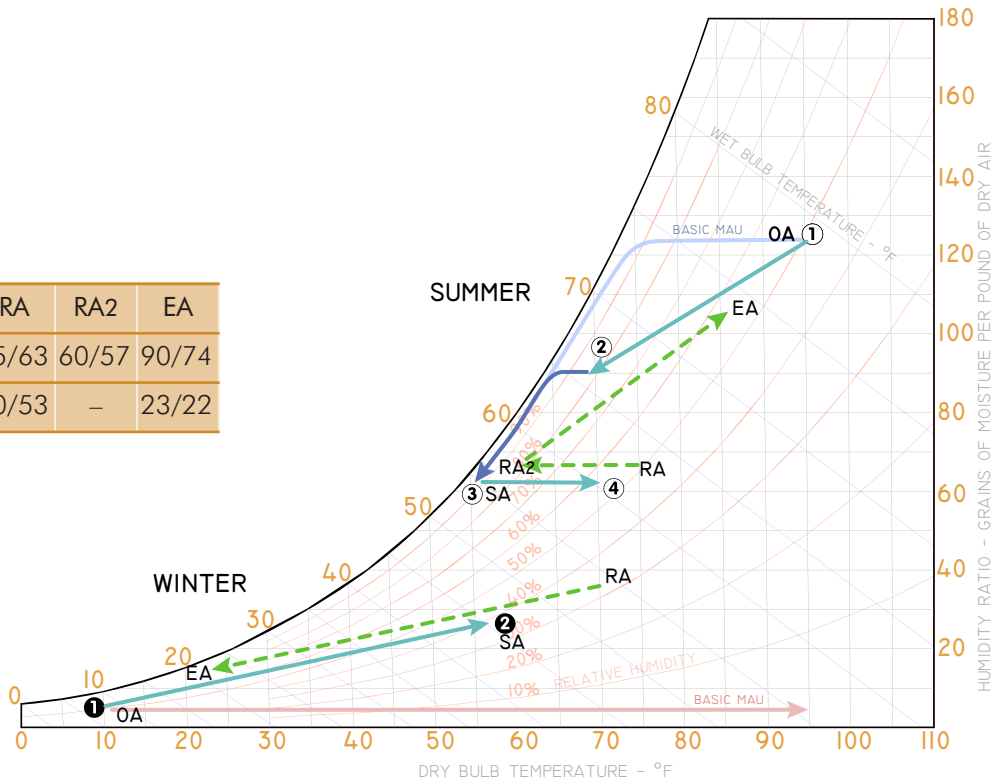
Process Sheet

Dual Wheel Unit with Cooling

This page shows a psychometric 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	④	RA	RA2	EA
S	95/78	69/66	55/55	70/61	75/63	60/57	90/74
W	10/8	56/44	–	–	70/53	–	23/22



Process Calculation (per 1000 cfm)

Summer Operation

Wheel effectiveness 75%

In this unit the air passes first through an enthalpy wheel and then through a sensible wheel. The first 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. The second wheel is used to reheat the air, eliminating the need for mechanical reheat.

①-② pre-cool section
Qt=4.5x1000x(41.4-30.8)=47.7 mbh (4.0 tons)

②-③ mechanical cooling
Qt=4.5x1000x(30.8-23.2)=34.2 mbh (2.8 tons)

③-④ free reheat
Qs=1.08x1000x(70-55)= 16.2 mbh

Winter Operation

Wheel effectiveness 70%

The winter operation is identical to a single wheel unit since the sensible wheel is stopped. The enthalpy 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
Qs=1.08x1000x(56-10)=49.7 mbh

humidification
$\dot{m}$=1000x4.5(24-6)=81,000 grain (11.5 lbs/hr)

Savings gained by energy recovery

cooling :	4 tons/1000 cfm	heating :	49.7 mbh/1000 cfm
reheat:	16.2 mbh/1000cfm	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

ANNEXAIR