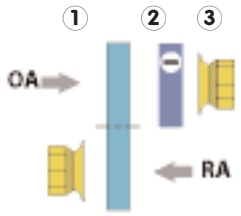
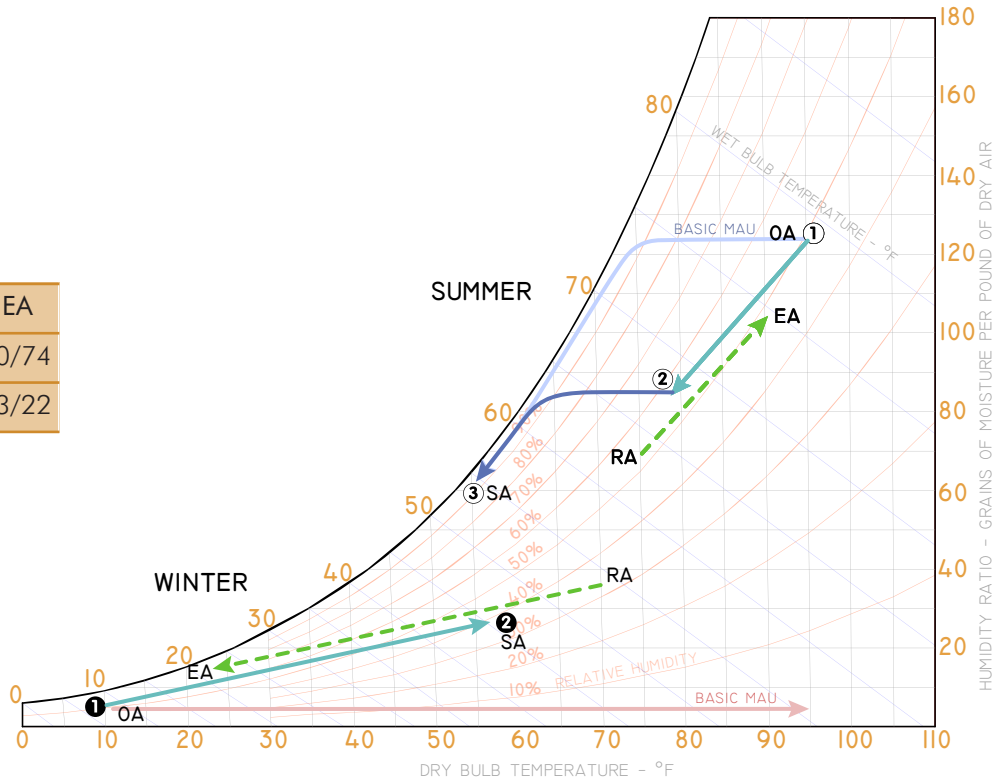
Process Sheet

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	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

Qt=4.5x1000x(41.4-32.4)=40.5 mbh (3.4 tons)

②-③ mechanical cooling

Qt=4.5x1000x(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

Qs=1.08x1000x(56-10)=49.7 mbh

humidification

$\dot{m}$=1000x4.5x(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