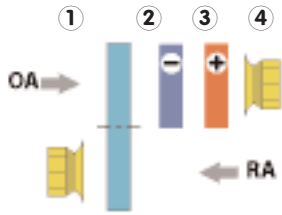


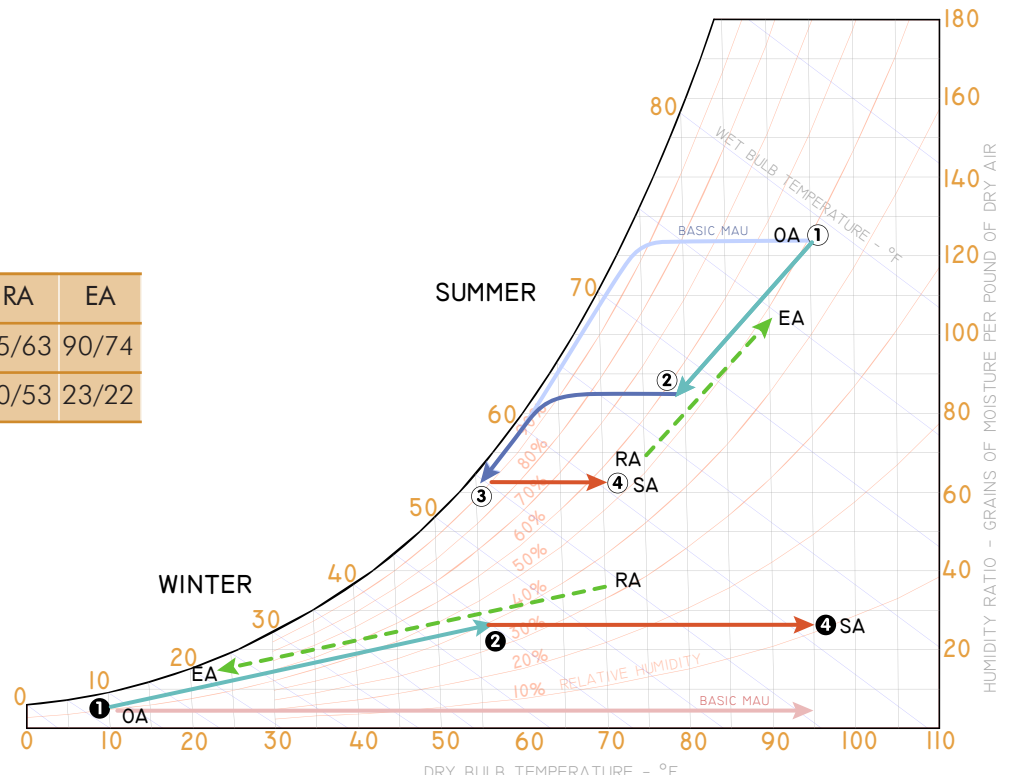
Process Sheet

Wheel Unit with Cooling and 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	④	RA	EA
S	95/78	80/68	55/55	70/61	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 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)
- ③-④ mechanical reheat
 $Q_s = 1.08 \times 1000 \times (70 - 55) = 16.2$ mbh

Winter Operation

Wheel effectiveness 70 %

The wheel pre-conditions the air reaching the heating coil unit by heating it and adding moisture, thereby requiring less mechanical heating and humidification. As a result, the heating coil can be downsized compared to a no-recovery process. The main coil's capacity can be further reduced by using the reheat coil in the 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
- ②-④ mechanical heating
 $Q_s = 1.08 \times 1000 \times (95 - 56) = 42.1$ 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