AIRotor
by XeteX

Air-to-Air Heat Recovery

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General

The AIRotor heat recovery unit is a rotary heat exchanger which operates on the air-to-air principle of heat transfer and has the following features:

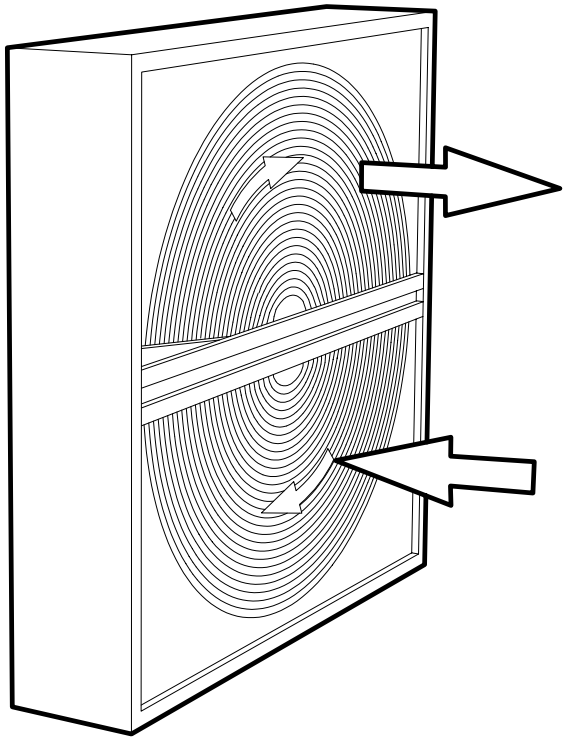
- Available in 16 sizes, with a nominal flow range of 500-28,000 cfm.
- Total energy recovery efficiencies as high as 90%.
- Rotor has smooth air channels to ensure a low pressure drop and reduce the risk of fouling.
- Rotor surface is manufactured absolutely smooth allowing for tight fitting seals between airstreams.
- Available with electronic speed control for variable rotor capacity.
- Hygroscopic rotor provides latent and sensible heat recovery.

Design

The RVA heat recovery unit is constructed from a rigid tubular steel welded frame, with insulated galvanized sheet metal cover plates and hatches. The frame is reinforced to prevent deflect of the rotor from static pressure drops to less than 0.03".

The rotor is assembled from alternate layers of flat and corrugated thin sheet aluminum. The smooth channels formed by this construction ensure that the air flow is laminar, thereby ensuring that the pressure drop is low and minimizing the risk of fouling by dirt or dust. Dry particles up to 900 microns shall pass freely through the rotor without clogging the media. The rotor media can be cleaned with low temperature steam without degrading unit performance.

The hygroscopic rotor equally transfers both sensible and latent heat. Moisture is transferred between airstreams in the vapor stage so media remains dry and no drain pan is required.



The rotor, which may be removed from the frame, is mounted in sealed permanently-lubricated spherical ball bearings. The bearings can be serviced or replaced without removing the rotor from the case.

The exchanger is sealed with brush seals between airstreams and around the perimetor of the rotor. Because of the the smooth rotor surface, the brush seals provides an extremely effective seal with very little contact pressure, resulting in extended service life.

An adjustable purging sector is provided to ensure continuous cleaning of the rotor and to virtually eliminate cross-contamination between the exhaust air the supply air.

The standard AIRotor heat recovery unit is supplied with a perimeter self adjusting drive belt and worm gear drive for on/off operation.

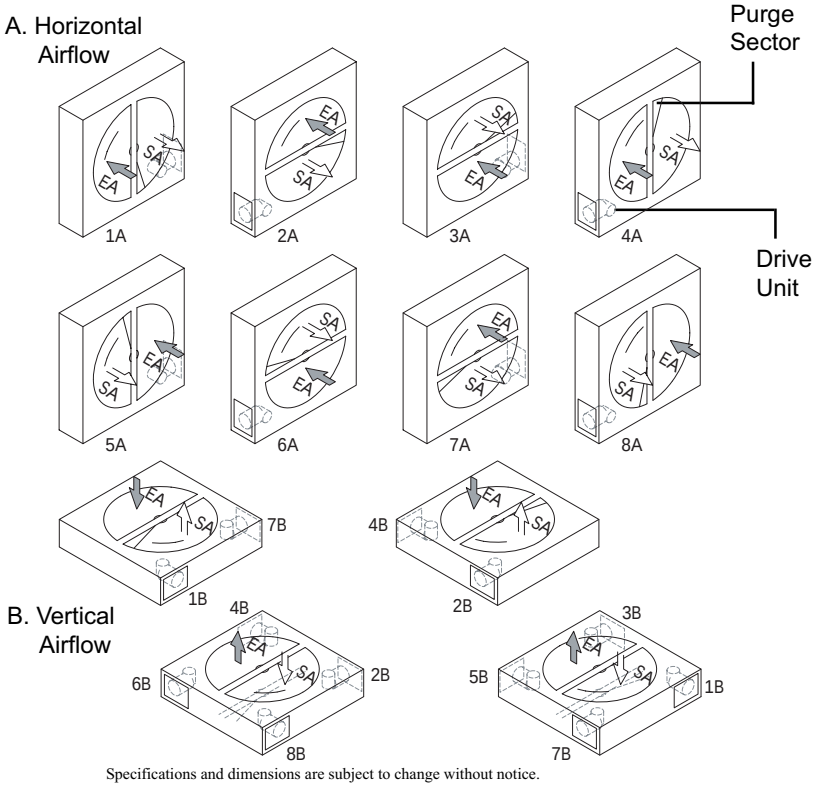
For installations where there is a requirement for controlling heat recovery capacity and/or rotor frost control, the heat recovery unit is equipped with an electronic control unit that varies rotor speed from maximum speed down to an automatic purge cycle of 1/20 rpm.

Specification

HRW RV(X)-a-b-c-d-e-f

RVB	0600, 0700, 0850, 1000, 1160
RVA	0600, 0700, 0850, 1000, 1250, 1500, 1750, 2000, 2250, 2500, 2750, 3000
Rotor Type	No = Non Hygros. Hy = Hygroscopic
Drive Unit	K = Constant Speed R = Electronic Speed Control (ESC)
Purge Sector	0 = Without 1 = With
Unit Config.	1, 2, 3, 4, 5, 6, 7, 8 (See Below)
Air Flow	A = Horizontal B = Vertical

Rotor Configuration



Accessories

	RVAT-x-x-x-x
Flanged Duct Connections	01
Epoxy Treated Rotor	02
Filter Sections	
2" Pleated	03
Washable Filters	04

Control Options

Constant Speed Drive

Speed Detector (w/Alarm Contact) (Standard with Elect. Spd Control)	05

Electronic Speed Control

Frost Control	06
Economizer Control	07
Summer Changeover	08

Description of Controls

Frost Control monitors the exhaust temperature leaving exchanger and reduces rotor speed to prevent exhaust temperature from dropping below setpoint.

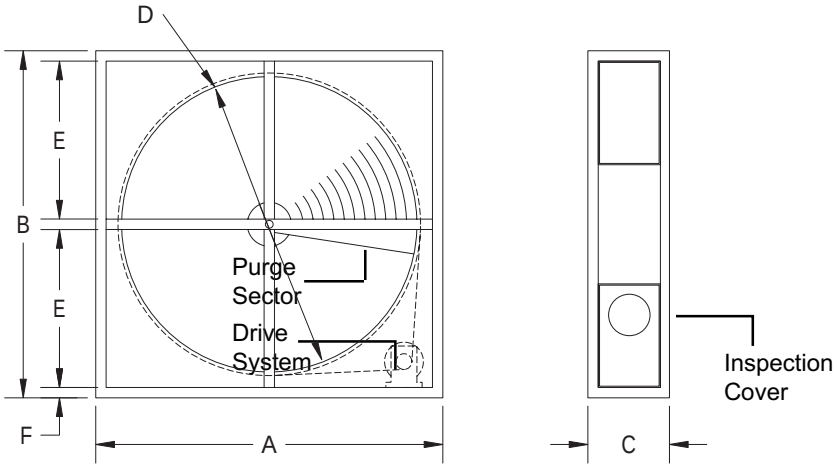
Economizer control monitors supply discharge temperature and reduces rotor speed to prevent discharge from rising above setpoint.

Summer Changeover control monitors outdoor air and return air temperatures and automatically switches rotor to maximum recovery speed when the outside air temperature is higher then the return air temperature.

Specifications and dimensions are subject to change without notice.

TECHNICAL SPECIFICATIONS

Dimensions and Weights



MODEL #	DIMENSIONS						WEIGHT (lbs)
	A	B	C	D	E	F	
RVB-0600	24.43	31.00	14.25	18.90	14.10	0.70	90
RVB-0700	31.00	31.00	14.25	23.23	14.10	0.70	155
RVB-0850	36.00	36.00	14.25	29.13	16.60	0.70	190
RVB-1100	43.60	43.60	14.25	37.50	20.40	0.70	265
RVC-1300	53.54	54.72	14.96	46.46	22.25	1.58	350
RVC-1600	62.05	63.23	14.96	57.09	27.00	1.58	440
RVC-1900	76.77	77.95	14.96	70.87	32.10	1.58	640
RVC-2100	85.04	86.22	14.96	78.35	37.00	1.58	735
RVA-2250	88.58	88.58	17.32	81.10	40.75	2.36	880
RVA-2500	98.74	98.74	17.32	90.94	45.67	2.36	1035
RVA-2750	108.58	108.58	17.32	100.79	50.59	2.36	1210
RVA-3000	118.43	118.43	17.32	110.63	55.51	2.36	1365

AIRotor Drive System

AIRotors are driven with a belt around the perimeter of the rotor. An AC gear reduced motor with permanently sealed bearings is easily serviced through an access panel in the corner of the wheel housing. A spare belt can be provided with each wheel to reduce downtime in the event of belt failure.

Constant Speed Drive

The AIRotor constant speed drive is provided with On/Off dry contacts for control by a thermostat or building control system. An optional speed detector is available which closed a normally open contact when wheel stops turning for over 20 minutes.

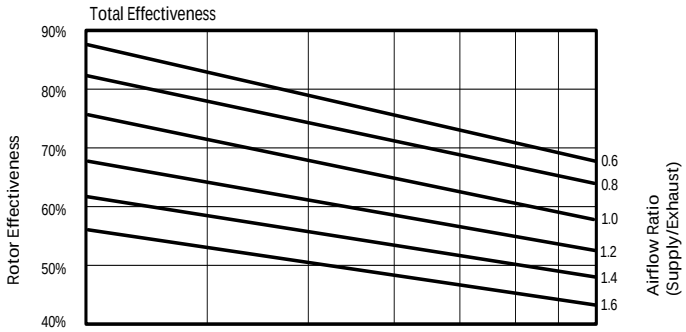
Electronic Speed Control

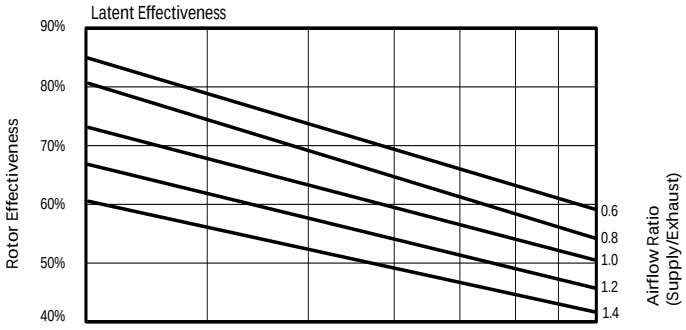
The AIRotor Electronic speed control consists of a motor control center and drive motor. The control center incorporates functions for purging, speed detection, motor protection and alarm. For speed control the control center is built to receive 0-10 VDC or 4-20 mA input from temperature controller.

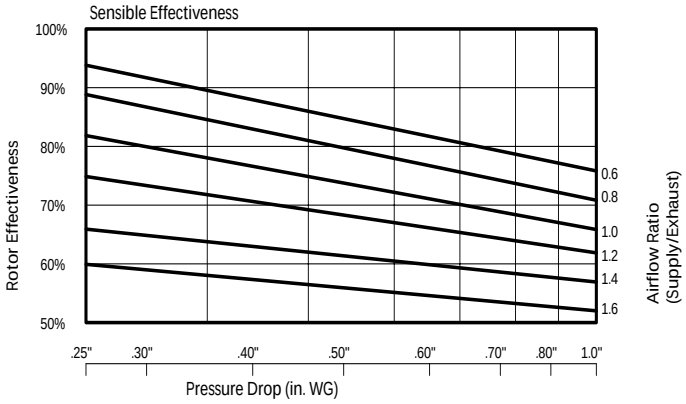
Frost, Economizer, & Summer/ Winter Changeover Control

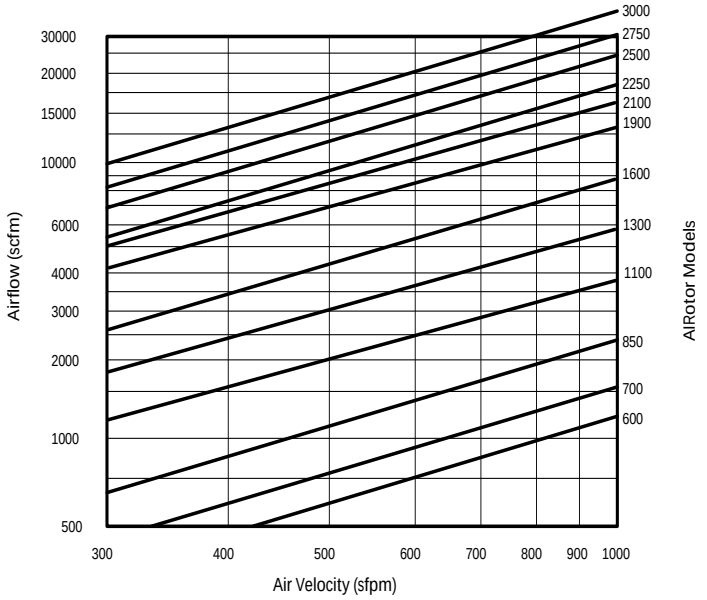
The AIRotor can be supplied with built-in temperature controller that automatically modulates rotor speed to prevent frost build-up, reduce heat recovery to prevent overheating space (economizer), and switch to maximum recovery during the summer (W/S Changeover). AIRotor is supply with integral control panel, digital temperature readout, and four remote mounted temperature sensors.

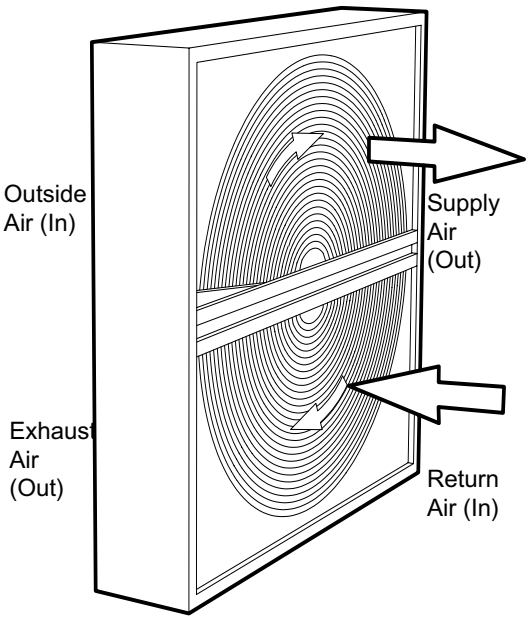
PERFORMANCE CHARTS









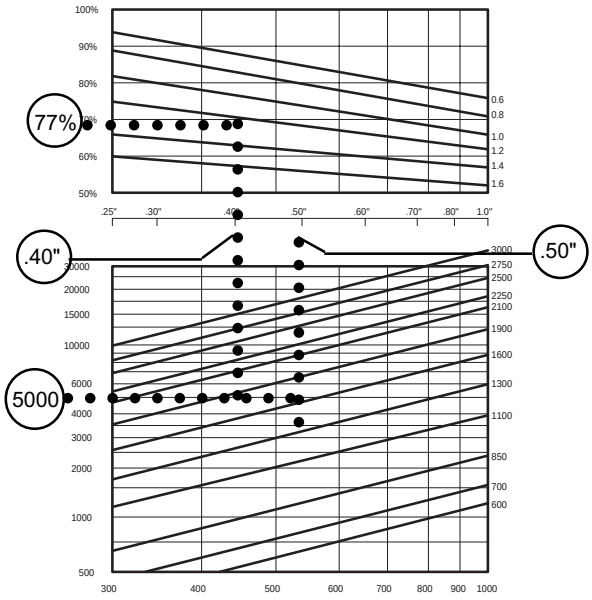


Example

Given the following conditions:
Supply Airflow = 5000 cfm
Return Airflow = 5000 cfm
Maximum Pressure Drop = 0.5" WG

Select AIRotor 1750

From the charts:
Pressure Drop = 0.40"
Effectiveness = 77%



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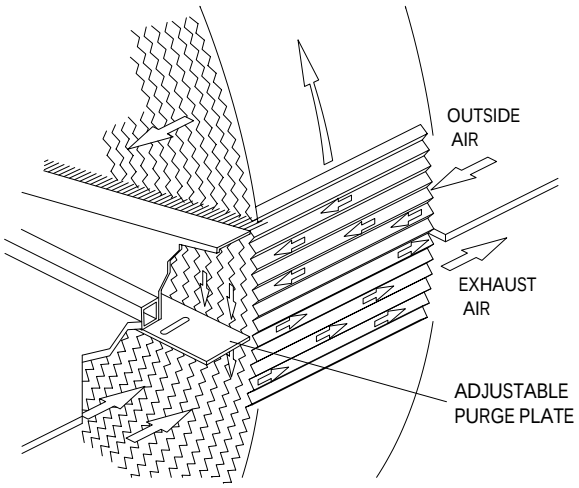
PURGING AND LEAKAGE AIRFLOW

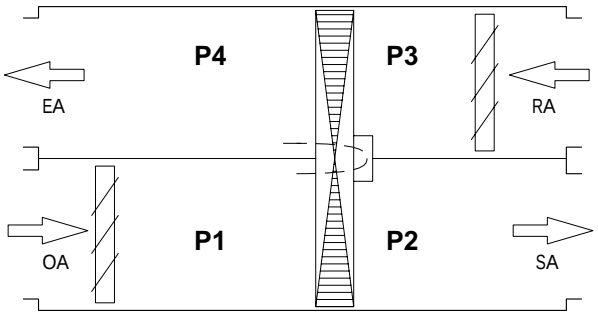
In rotary heat exchangers a certain amount of leakage inevitably takes place, in both directions, between the supply air and exhaust air sides, the leakage air being transferred by the rotor.

The purging sector is used to clean the rotor to eliminated leakage from the exhaust air to the supply air side. A detail of the purge sector is shown below.



Purge Sector Detail

When installing a unit provided with a purging sector, the fans should be located so that P1 > P4 and
P2 > P3, as shown in the figure below. If required,



Purge Schematic

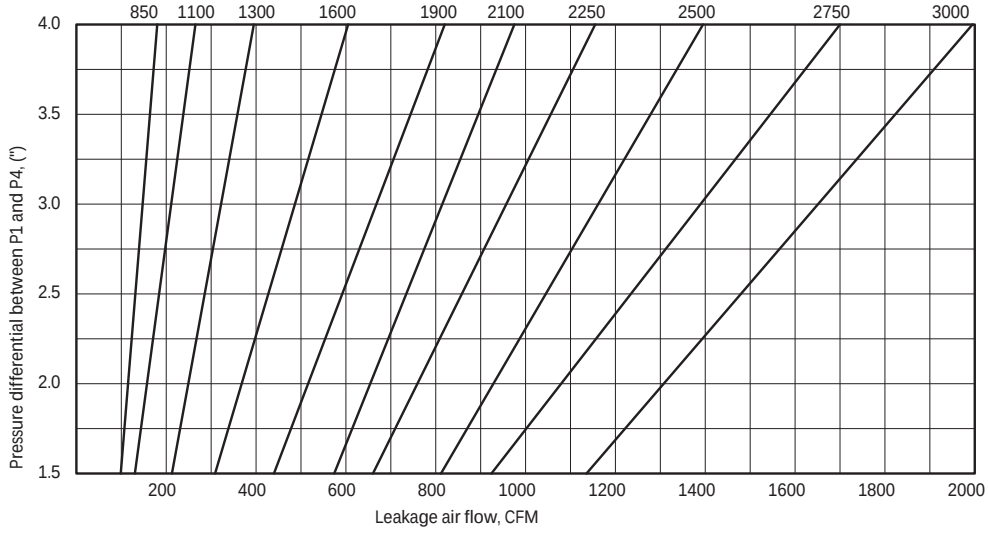
an adjusting damper may be used to obtain the required pressure balance.

The chart below shows the leakage flow throught the purging sector. Allowance for high differential pressures should be made when selecting the fan.

Purge Airflow Chart

AIRotor Model

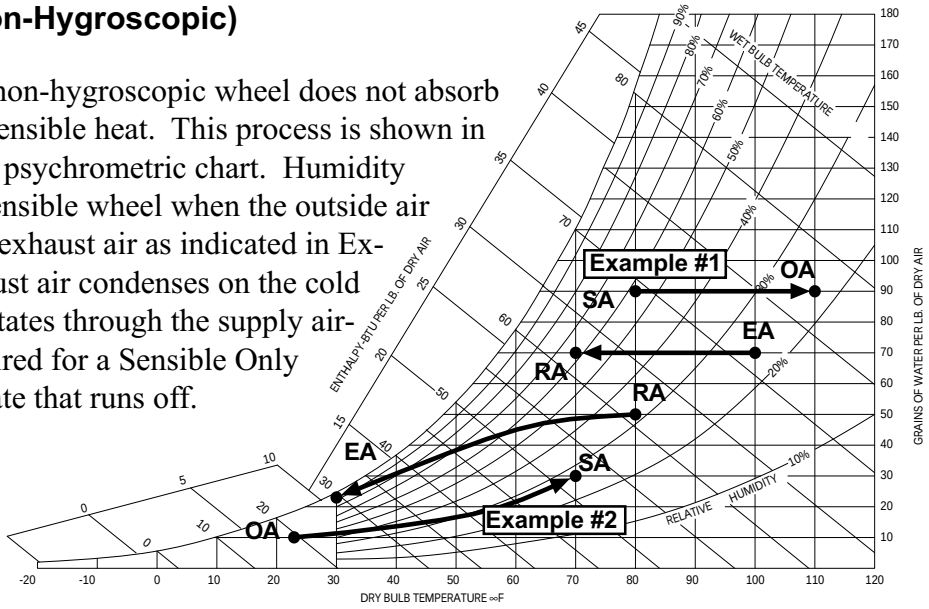
Approximate leakage through the purging sector and seals
HYGROSCOPIC ROTOR @ 20 RPM



PSYCHROMETRIC ANALYSIS

Sensible Only Wheel (Non-Hygroscopic)

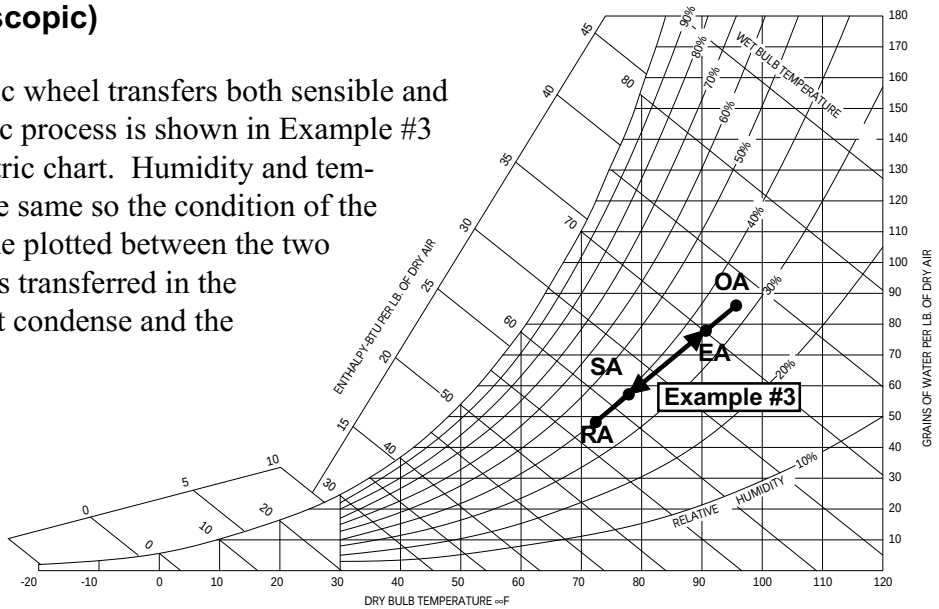
The Sensible Only wheel or non-hygroscopic wheel does not absorb moisture and transfers only sensible heat. This process is shown in Example #1 on the adjoining psychrometric chart. Humidity transfer only occurs with a sensible wheel when the outside air is below the dewpoint of the exhaust air as indicated in Example #2. The warmer exhaust air condenses on the cold wheel and evaporates as it rotates through the supply airstream. A drain pan is required for a Sensible Only wheel to collect the condensate that runs off.



SA = Supply Air
RA = Return Air
OA = Outside Air
EA = Exhaust Air

Enthalpy Wheel (Hygroscopic)

The Enthalpy or Hygroscopic wheel transfers both sensible and latent heat. This hygroscopic process is shown in Example #3 on the adjoining psychrometric chart. Humidity and temperature effectiveness are the same so the condition of the air varies along a straight line plotted between the two inlet conditions. Humidity is transferred in the vapor stage so the air doesn't condense and the wheel stays dry.



GENERAL SPECIFICATION

ROTARY AIR-TO-AIR HEAT EXCHANGER

Furnish an "AIRotor" rotary air-to-air heat exchanger manufactured by XeteX, Inc. Exchanger shall include hygroscopic rotor, constant or variable speed drive, rotation detector with alarm connection, and speed controller with temperature sensors.

ENTHALPY RECOVERY WHEEL

Exchanger shall be constructed of alternate Layers of corrugated and flat aluminum sheet material. Both sides of the exchanger shall be completely smooth with less then 0.005" variation between alternate layers to allow for optimum sealing surface for brush seals. The rotor shall have smooth air channels to ensure laminar airflow for low pressure drops. Dry particles up to 900 microns shall pass freely through the rotor without clogging the media. The rotor media shall be capable of being cleaned with low temperature steam without degrading unit performance. The rotor media must be made of aluminum which is coated to prohibit corrosion. All surfaces shall be coated with a nonmigrating adsorbent specifically developed for the selective transfer of water vapor.

* Verification in writing must be presented from independent laboratory evaluations confirming that the desiccant adsorbent surface does freely transmit water vapor without detectable gaseous cross-contamination. Specially formulated aluminum compound of "Micro-Sieve" shall permanently bond the selective adsorbent desiccant to the hygroscopic (enthalpy) recovery AIRotor by XeteX.

* Sensible and latent recovery efficiencies must be clearly documented through a certification program conducted in accordance with ASHRAE 84-1991 and ARI 1060 standards that verify actual performance to be *independent phenomena and there is no reason to expect that ...(*efficiencies*)... will be equal.* Performance is derived by assuming equal sensible and latent recovery effectiveness.

UNIT HOUSING

The rotor housing shall be constructed using a heavy duty welded tubular steel frame (rotors under 42" shall have a heavy duty galvanized frame) with galvanized sheet metal cover plates and inspection hatches. Adjustable brush seals must be provided along the periphery of the rotor and between the inlet and outlet air passages to effectively prevent air leakage and cross-contamination between airflows. Total airflow between airstreams from leakage and purge shall be less than 10% @ 2.5"w.g. differential pressure between airflows. Rotor and casing shall be reinforced to prevent deflection from differential pressures to less than .03 inches. All rotors shall be mounted on sealed permanently-lubricated spherical bearings. All rotors over 42" in diameter must have flanged or pillow block bearings that can be serviced or replaced without removal of the rotor from the rotor housing.

PURGE SECTOR

* The unit must be provided with a factory set, field adjustable purge sector designed to limit cross contamination at qualified appropriate design conditions to operate at less than .04 percent of that of the exhaust air stream concentration. Independent laboratory evaluations must indicate purge sector configurations, rotor construction, gasses, air pressure differentials, rotor speeds and other phenomena that constitute "appropriate design conditions" required to limit cross-contamination and air leakage.

DRIVE SYSTEM/SPEED CONTROL

The rotor drive system shall consist of a self adjusting belt around the rotor perimeter driven by an AC motor with gear reduction. The variable speed drive shall be specifically designed for heat wheel applications to include: an AC inverter, soft start/stop, rotation detection w/alarm contacts, automatic self cleaning jog cycle, and self testing capability. The speed controller shall be capable of accepting any control signal (potentiometer, VDC, and mA).

AUTOMATIC TEMPERATURE CONTROL

The temperature control system shall consist of an integral control panel with remote temperature sensors mounted in each of the four airstreams to monitor exchanger performance. The control shall modulate rotor speed to (1) prevent frost build-up, (2) reduce heat recovery for economizer mode, (3) switch to maximum heat recovery when outdoor temperature is higher than indoor temperature. A rotation detector/alarm shall be built into control panel with contactor provided for connection building control system.

*** Refer to independent performance tests of XeteX AIRotor Total Energy Recovery Wheels conducted, evaluated and verified for the specified characteristics by research assistants from the Department of Mechanical Engineering, University of Minnesota, Minneapolis. Detailed Technical Reports that certify Thermal Effectiveness and Cross-Contamination performance are available on request.**

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