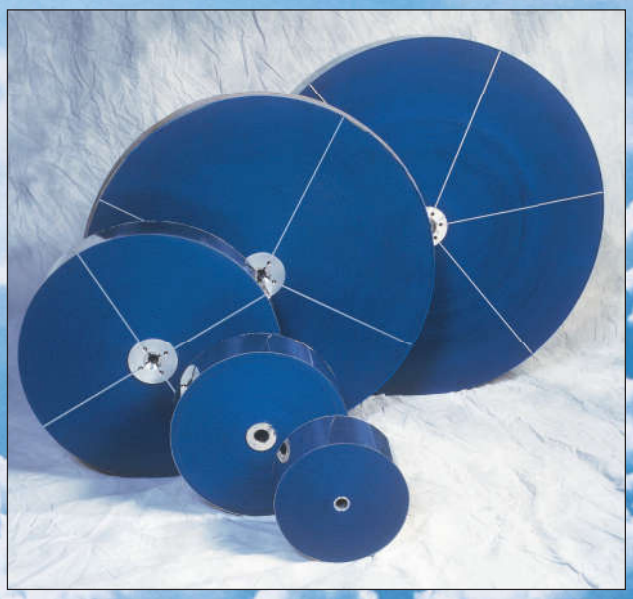
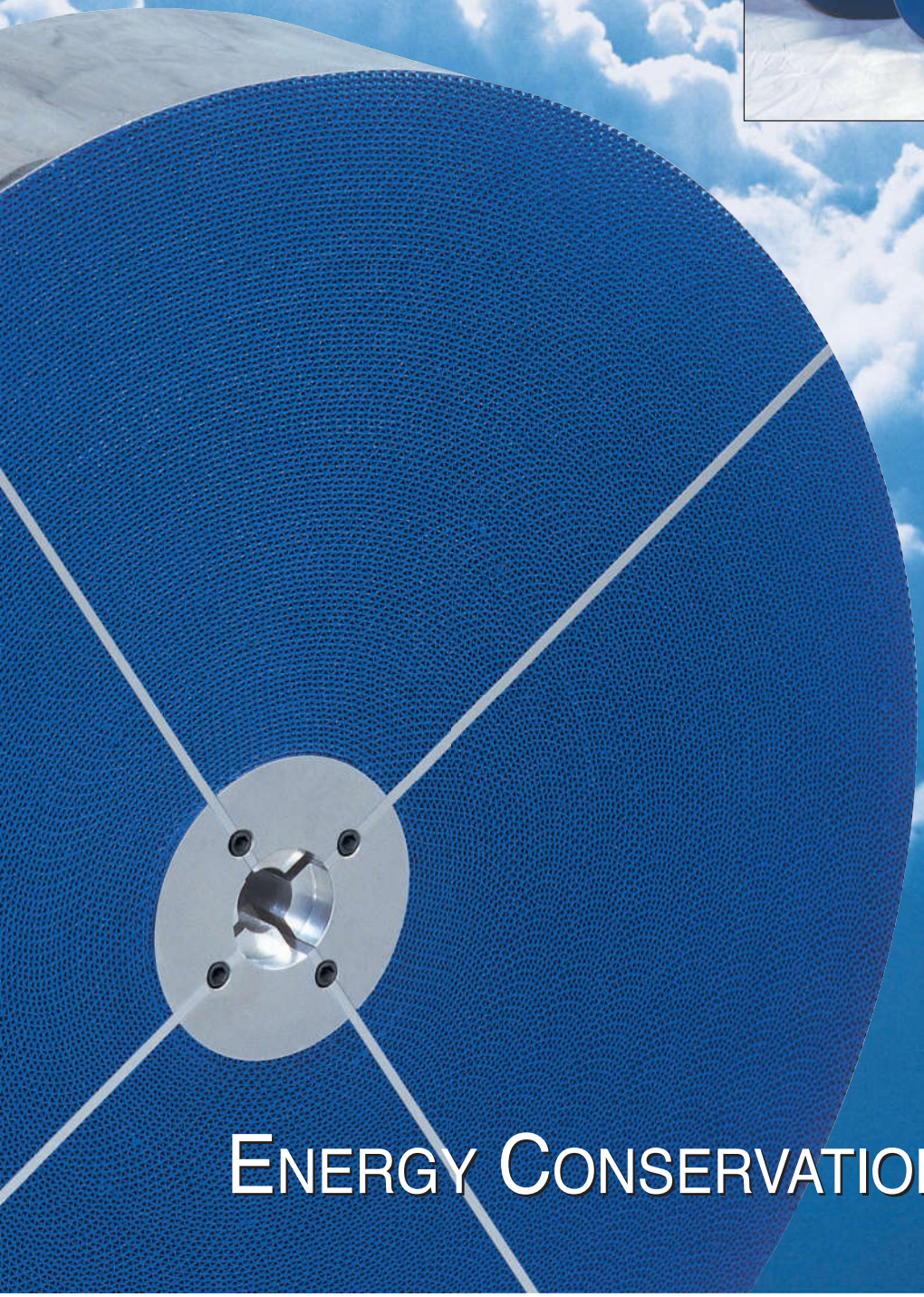
NovelAire®

Creating the Great Indoors®





AHRI CERTIFIED®
www.ahridirectory.org

Air-to-Air ERV
AHRI Standard 1060

Energy Recovery COMPONENT is certified. Actual performance in packaged equipment may vary.

Energy Conservation Wheel

NovelAire Technologies
Energy Conservation Wheel

Energy Efficient Ventilation

The NovelAire Technologies Energy Conservation Wheel (ECW) is a rotary counter flow air-to-air exchanger designed to provide maximum energy efficiency in ventilated systems where heated or cooled air is exhausted and outdoor air is introduced as makeup. In applications where ventilation is required, energy recovery wheels are used to reduce the initial investment in HVAC equipment and to minimize operating costs. Since HVAC equipment is typically the largest single source of energy consumption in residential and commercial buildings, ECW investments are economically justified on most new and retrofit HVAC systems with 15% or more outdoor air makeup. In new HVAC installations, ECWs also allow ventilated systems to be sized with smaller compressors, condensers, and other DX components, lowering the first cost of the HVAC package.

- Improves indoor air quality
- Reduces the ventilation energy penalty
- Transfers both latent and sensible energy
- Lowers operating costs
- Lowers first costs on new installations
- Both winter and summer energy savings

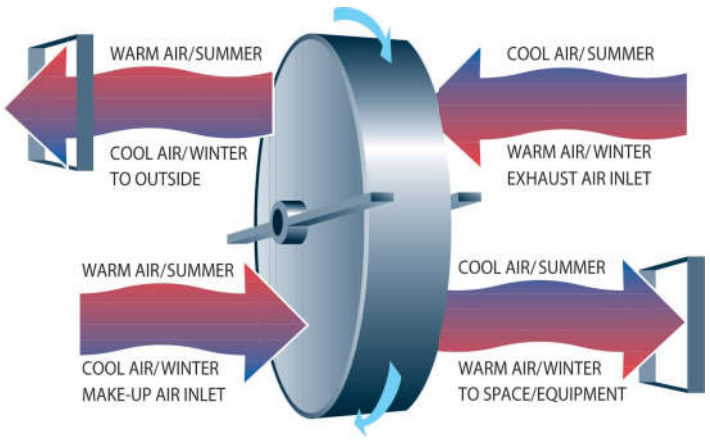
Improve Indoor Air Quality

Ventilation accomplishes several objectives: (1) It purges the conditioned space of unwanted pollutants such as organic vapors, dust, radon, etc. and, (2) It purges the space of unwanted products of human activity such as tobacco smoke, carbon dioxide, bacteria, and germs.

Poor indoor air quality has been directly associated with the “sick building syndrome”, a condition that can result in high illness rates, absenteeism, and productivity decreases. Consequently, design engineers are becoming increasingly aware of the need to design proper air quality into HVAC systems.

ASHRAE Standard 62.1-2019 (Ventilation for Acceptable Indoor Air Quality) describes a mandated ventilation rate for a variety of application and building types. ASHRAE 90.1-2019 (Energy Standard for Buildings Except Low-Rise Residential Buildings) describes minimum requirements for energy efficiency of buildings and energy recovery for use when buildings are ventilated. Building codes in the U.S. and abroad are using these standards in building design specifications. Architects and engineers are including greater amounts of fresh air makeup in their HVAC systems, and are doing so without a significant energy penalty by including exhaust air energy recovery.

The NovelAire ECW is designed to provide for all season ventilation, providing acceptable IAQ year-round, normally without the expense of additional HVAC-direct expansion capacity and with minimal extra energy costs.



ECW Features and Benefits

NovelAire ECWs are constructed of our proprietary synthetic fiber-based media impregnated with a non-migrating water selective molecular sieve desiccant. The fiber and desiccant, intimately bound together in our process, form sheets with excellent heat and mass transfer properties which are corrugated and spirally wound into wheels. Unlike other media, the desiccant is uniformly and permanently dispersed throughout the matrix structure in contrast to being coated, bonded, or synthesized onto the matrix, and thus is not susceptible to delamination or erosion of the desiccant material.

- Homogenous media. Not coated or bonded and will not delaminate
- Synthetic wheel media is completely corrosion resistant
- Synthetic wheel media maximizes desiccant loading
- Unitary wheel construction maximizes face flatness
- Fluted geometry minimizes internal cross leakage
- Molecular sieve desiccant reduces cross contamination
- Wheel is completely water washable
- ECWs offered in 4”, 6”, or 12” deep wheels for single unit air volumes up to 60,000 cfm
- Tough wheel face resists damage and is easily repaired

ECW Cassettes

- Heavy duty galvanized steel construction. Larger units constructed of welded structural tubing with optional stainless-steel construction
- No-maintenance bearings standard on small cassettes
- Flanged or pillow block outboard bearings used on larger cassettes
- Full contact, lined brush seals minimize leakage
- Adjustable purge section reduces cross contamination
- AC drive motor with PowerTwist™ link belt
- Controls available as an option

Note: detailed ECW wheel, cassette specifications and software selection programs are available at www.novelaire.com

Performance Certification

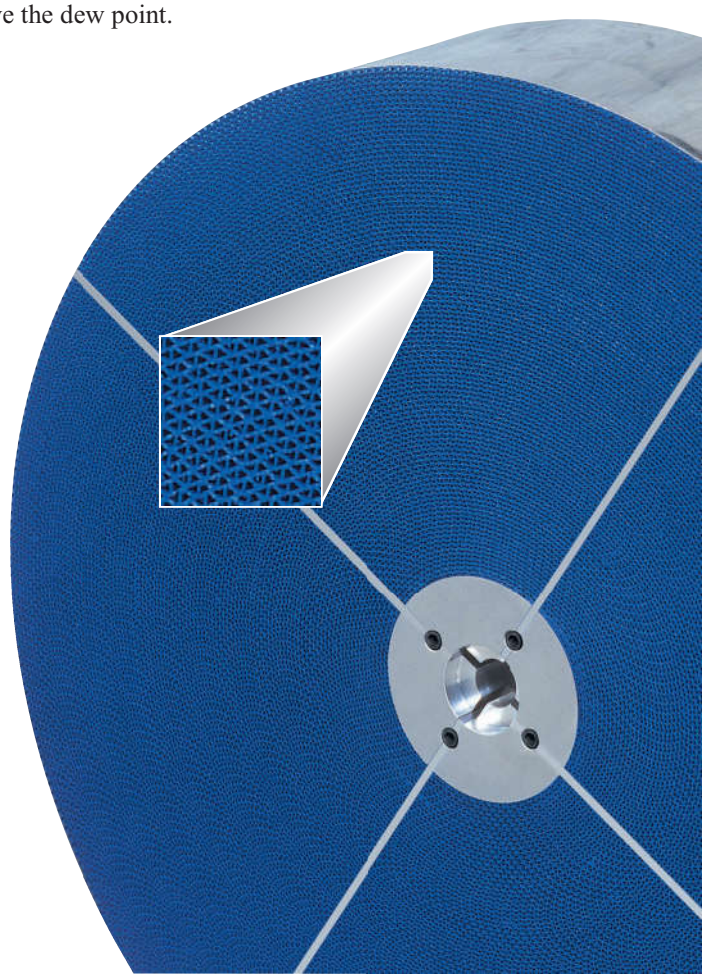
NovelAire ECWs are UL tested and are a UL recognized component for heat recovery ventilators and other HVAC equipment.

NovelAire ECWs are AHRI certified using the 84-2020 ASHRAE Standard (Method of Testing Air-to-Air Heat/Energy Exchangers) and AHRI Standard 1060-2018 (Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment).

Frost Protection

During extremely cold winter time conditions, frost formation becomes a possibility in the exhaust air stream. Frost formation on the wheel will basically act to plug or reduce air flow but will not hurt the wheel itself.

In practice several types of frost prevention are employed; heating return air, heating outdoor air, variable speed control, and air bypass. NovelAire generally recommends preheating outdoor air to keep exhaust air from freezing. Wheel speed control works to limit frost formation by reducing wheel performance to a level where the exhaust air temperature is kept above the dew point.



ECW Selection and Calculations

ECW Selection

NovelAire offers software selection available on www.novelaire.com. The following example shows the basic concepts for selecting ECWs for a balanced system (Air Ratio = 1.0). For calculations using unbalanced Air Ratios (>1.0), please refer to our software program or contact the factory for assistance.

I. Example:

Design parameters:

Outdoor: 4500 cfm, 95˚F dry bulb, 75.1˚F wet bulb, 99 grains ($0.0142 lb_{moisture}/lb_{dry\ air}$)

Return: 4500 cfm, 75˚F dry bulb, 62.4˚F wet bulb, 64 grains ($0.00914 lb_{moisture}/lb_{dry\ air}$)

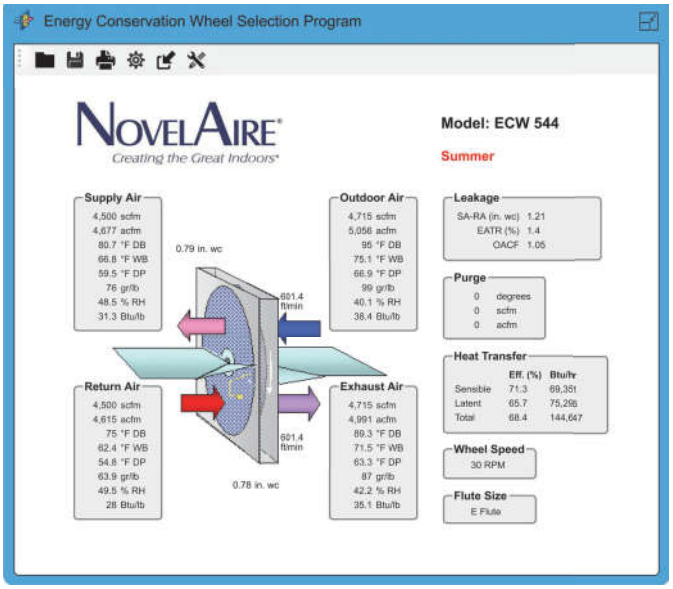
Air Ratio (A.R.): 1.0, balanced flow.

Size Determination:

If unit size is a limitation in your package, first refer to the Engineering Detail Table on the next page to identify the appropriate cassette size for your application.

For the purpose of this example, let's choose an ECW544. Using the performance simulation software at the design conditions yields the following performance:

Sensible effectiveness:	71.3%
Latent effectiveness:	65.7%
Total effectiveness:	68.4%
Pressure Drop:	0.79 in. wc



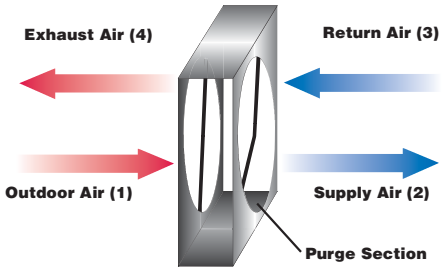
II. Exact Determination of Supply and Exhaust Air Conditions:

The following illustrates a manual calculation of the effectiveness derivation. The effectiveness is represented by the following equations:

$$\varepsilon = \frac{\dot{m}_e}{\dot{m}_{min}} \frac{X_4 - X_3}{X_1 - X_3} \qquad \varepsilon = \frac{\dot{m}_s}{\dot{m}_{min}} \frac{X_1 - X_2}{X_1 - X_3}$$

Where:

ε = sensible, latent, or total heat effectiveness;
X = dry bulb temperature for sensible effectiveness, humidity ratio for latent effectiveness, total enthalpy for total effectiveness;
$\dot{m}_e$ = mass flow rate of the exhaust, mass of dry air per unit time;
$\dot{m}_s$ = mass flow rate of the supply, mass of dry air per unit time;
$\dot{m}_{min}$ = minimum value of either mass flow rate;



Using the design parameters of the previous example, we can calculate the supply air conditions below. The same method can be used for calculating exhaust air conditions. The dry bulb temperature is calculated by using the sensible effectiveness:

$$T_2 = \frac{\dot{m}_{min}}{\dot{m}_s} \varepsilon (T_3 - T_1) + T_1$$
$$= \frac{4500}{4500} 0.713 (75 - 95) + 95$$
$$= 80.7$$

Similarly, the humidity of the supply air flow is calculated using the latent effectiveness:

The supply conditions are therefore completely defined as:

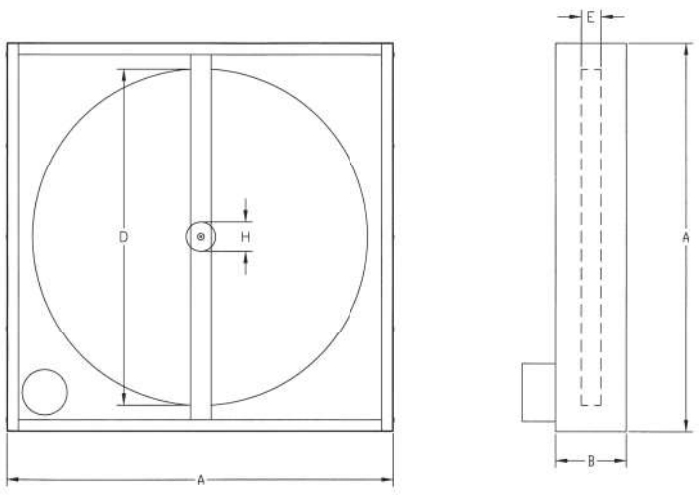
$$W_2 = \frac{\dot{m}_{min}}{\dot{m}_s} \varepsilon (W_3 - W_1) + W_1$$
$$= \frac{4500}{4500} 0.657 (64 - 99) + 99$$
$$= 76.0$$

Dry bulb temperature: 80.7˚F

Humidity: 76 grains of moisture per pound of dry air

Engineering Detail

Model	Nominal Flow Rate (SCFM)	Wheel Diameter D (inches)	Wheel Depth E (inches)	Cassette Height/Width A (inches)	Cassette Depth B (inches)	Nominal Weight (pounds)
ECW204	600	20	4	23	7	40
ECW244	900	24	4	27	7	70
ECW324	1,500	32	4	39	7	160
ECW364	2,000	36	4	42	7	190
ECW424	3,000	42	4	48	7	200
ECW484	4,000	48	4	54	8	270
ECW544	5,000	54	4	60	8	320
ECW486	5,000	48	6	54	10	310
ECW604	6,000	60	4	66	8	440
ECW546	6,000	54	6	60	10	350
ECW664	7,500	66	4	72	9	540
ECW606	7,500	60	6	66	10	540
ECW724	9,500	72	4	78	9	670
ECW666	9,500	66	6	72	11	630
ECW784	11,000	78	4	84	9.5	720
ECW726	11,000	72	6	78	11	700
ECW844	13,000	84	4	90	9.5	810
ECW786	13,000	78	6	84	12	880
ECW846	15,000	84	6	90	12	1,050
ECW906	17,500	90	6	96	12	1,130
ECW966	20,000	96	6	102	12	1,400
ECW1026	22,500	102	6	108	12	1,630
ECW1086	25,000	108	6	116	15	2,200
ECW10812	27,500	108	12	116	21	2,990
ECW1206	30,000	120	6	129	15	2,750
ECW12012	32,500	120	12	129	21	3,380
ECW1326	37,500	132	6	140	15	3,070
ECW13212	40,000	132	12	140	21	3,830
ECW14412	50,000	144	12	153	21	4,400
ECW15612	60,000	156	12	165	21	5,200



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