

# NOVEL-ICE

**Energy Efficient Ice Rink Dehumidifiers**  
**Advanced Humidity Control**



**NOVELAIRE® TECHNOLOGIES**  
Creating the Great Indoors®

## TESTIMONIALS



**NOVEL-ICE 10000** with ventilation air precooling



### ***Ice Arena, City of Plymouth, MI***

As part of an overall energy efficient revamp project for the ice arena, the city of Plymouth, MI replaced an old gas fired dehumidifier with a state of the art **NOVEL-ICE 10000** dehumidifier. The **NOVEL-ICE** unit removes moisture with 35% less energy than the old gas fired unit during high humidity days. The **NOVEL-ICE** unit has been operating since 2012 and according to the facilities manager, “it out performs our old gas fired unit and, if we do get caught behind, it brings the humidity down to set point in no time. Also, if we ever have a problem NovelAire’s customer service is outstanding.”

### ***Galt Arena, Cambridge, ON***

The Galt Gardens Arena, located in Cambridge, ON, is the oldest operating ice rink in the world. With seating capacity for ~1,200 occupants, Galt Gardens is the home of the Cambridge Winterhawks Jr. B hockey team. The original building dehumidification system used (4) 7.5TR refrigerant based defoggers which never achieved satisfactory space conditions. The City of Cambridge issued a design build proposal to upgrade the dehumidification equipment with the ultimate goal of improving space conditions and reduce energy consumption while lowering the overall carbon footprint for the facility. The **NOVEL-ICE 12000 ERV** was installed and delivers the following:



- 33% reduction in energy consumption and a 39% reduction in greenhouse gas emissions compared to the existing defoggers.
- The capacity to deliver 12,000-cfm conditioned ventilation air to the space, meeting ASHRAE 62 requirements (through the ERV section).
- Integrated CO<sub>2</sub> and CO gas transmitters for demand based ventilation control.

**NOVEL-ICE 12000 ERV**

# A BETTER WAY TO DEHUMIDIFY ICE RINKS

Controlling the humidity level in an ice rink is a particularly challenging (and costly) problem since low dew points are required to maintain proper ice conditions, prevent condensation within the arena, and to provide the proper indoor environment for spectators. The typical design dew point of 35F is beyond the practical limits of standard refrigeration/reheat dehumidifiers so consequently, desiccant based dehumidification systems have become the standard for delivering low dew point air to ice arenas. Unfortunately, the use of gas fired desiccant dehumidifiers have presented a host of problems that plague rink owners and operators. Operating costs are excessive due to the expense of regenerating a desiccant wheel with natural gas, maintenance costs are excessive as the desiccant wheel life is compromised with the constant exposure to the products of combustion, installation costs are high since gas service is required, and regeneration and exhaust ducting may be needed.

NovelAire Technologies has addressed these limitations with the development of its **NOVEL-ICE** series of desiccant based dehumidifiers that combine the benefits of refrigeration type dehumidification with desiccant technology- all without natural gas. The **NOVEL-ICE** cycle has the unique ability to deliver comparable dew points with far less energy consumption, and with a much simpler and easier to maintain operating cycle.

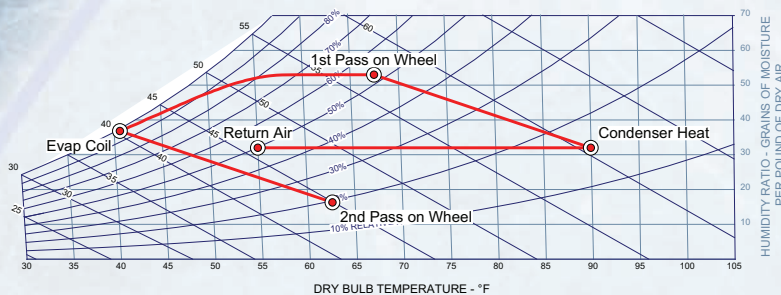
## **NOVEL-ICE vs Gas Fired Dehumidifiers**

- UP to 35% reduction in energy consumption
- Delivers lower temperature supply air
- Gas connection not required
- Lower maintenance cost



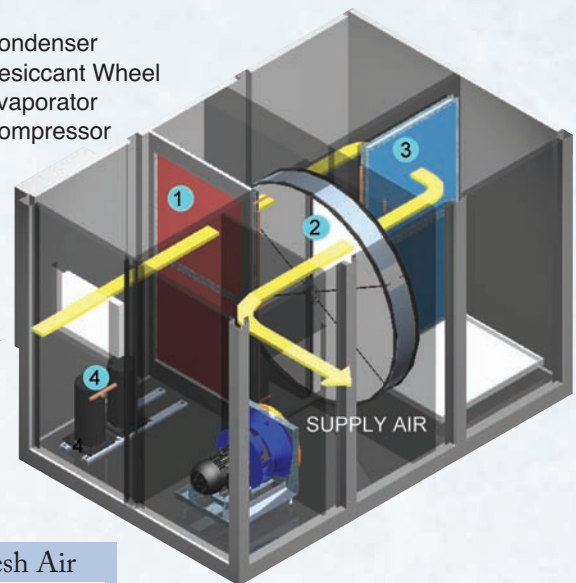
# HOW IT WORKS

The **NOVEL-ICE** unit is comprised of a proprietary desiccant wheel positioned between the coils of a refrigeration circuit. The desiccant wheel is specifically designed to dehumidify saturated air and deliver maximum grain depression with a very low reactivation temperature. Return air (or a blend of OA with RA) from the space flows across a condensing coil where it is heated. The warmer air is then used to regenerate the desiccant wheel which increases the moisture content of the air prior to the evaporator coil. The evaporator coil wrings out moisture and the saturated air leaving the coil is then further dehumidified by the second pass through the desiccant wheel. The ability of the desiccant wheel to move moisture around the evaporator coil, allows the evaporator to operate at a higher temperature and the condenser at lower temperatures resulting in below freezing dew points at a high compressor COP (5-5.5).



The above chart shows the psychrometric path for the **NOVEL-ICE** dehumidifier. Return air – heats up across the condenser- regenerates the wheel on the 1st pass- moisture removed from the evaporator coil - further dehumidification on the second pass- dry supply air to the rink.

- 1 Condenser
- 2 Desiccant Wheel
- 3 Evaporator
- 4 Compressor



## PERFORMANCE OF A STANDARD NOVEL-ICE 8000 UNIT

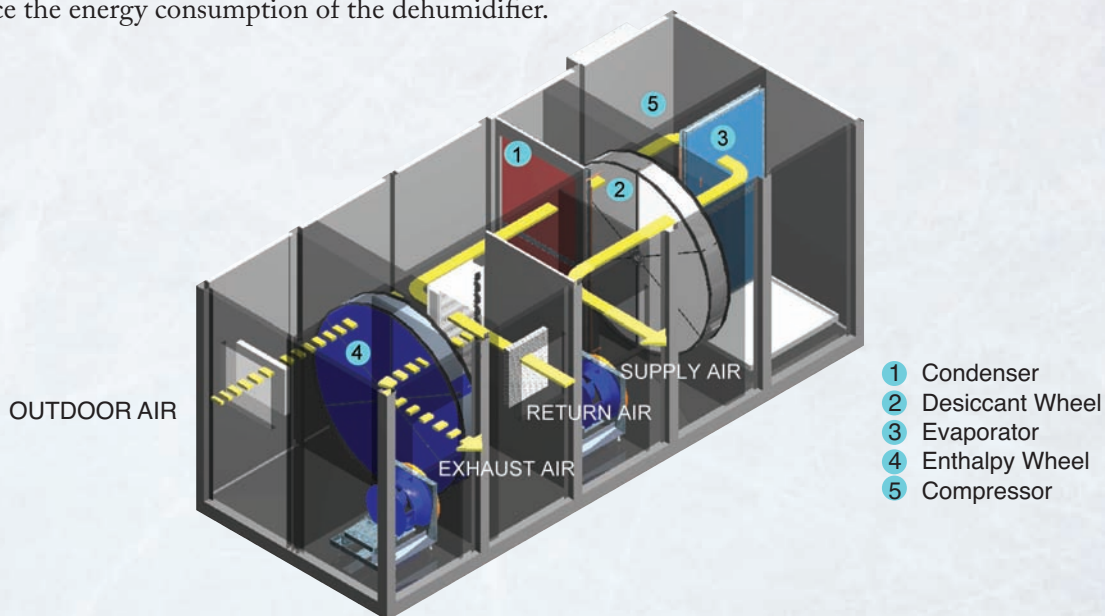
	0 cfm Fresh Air	1000 cfm Fresh Air
Flow (cfm)	8000	8000
Supply Air Temp (F)	69.4	74.6
Supply Air DP (F)	26.3	32.2
Capacity, lb/h	62.1	78.7
Electrical Power, KW	19.1	20.1
Op Costs \$/lb water	0.031	0.025

Basis: RA 55F/32 gr/lb, OA 80F/120 gr/lb, \$.1/kwh

Optional precooling is available for the **NOVEL-ICE** units should higher levels and longer duration of ventilation air be required. For short ventilation periods, larger quantities of untreated ventilation air can be process through the unit but, with a corresponding increase in supply air temperature and dew point.

# ENERGY EFFICIENT VENTILATION

Optional energy recovery can be used on the front end of the **NOVEL-ICE** unit to further enhance its energy efficiency. Since ventilation air is the main source of moisture for an ice rink, using an energy recovery wheel to pretreat the outside air is the most efficient way to reduce the energy consumption of the dehumidifier.



## PERFORMANCE FOR A NOVEL-ICE 8000 WITH ENERGY RECOVERY

	0 cfm Fresh Air	2000 cfm Fresh Air	4000 cfm Fresh Air
Flow (cfm)	8000	8000	8000
Supply Air Temp (F)	69.4	70.3	77.1
Supply Air DP (F)	26.3	27.6	36.5
Capacity, lb/h	62.1	163.5	267.8
Electrical Power, KW	19.1	22.1	23.2
Op Costs \$/lb water	0.031	0.014	0.009

Basis: RA 55F/32 gr/lb, OA 80F/120 gr/lb, \$.1/kwh

As the above chart shows, utilizing an energy recovery wheel to process fresh air has a substantial positive impact on the amount of moisture removed and the energy consumed to remove the moisture from both fresh air and the rink air.

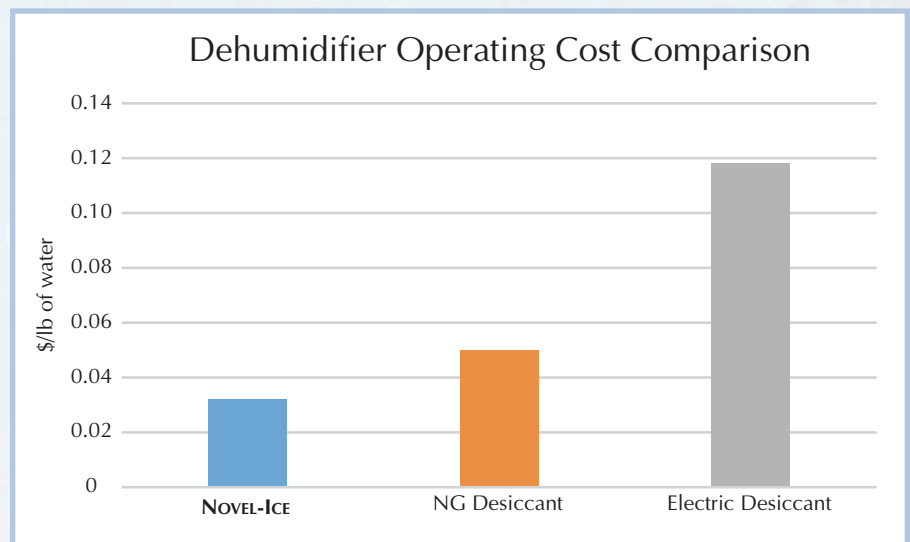
Control strategies with preset levels of outdoor air based on measured CO/CO<sub>2</sub> levels are typically used to optimize the amount of outside air brought into the arena. During the unoccupied mode, return air bypasses the energy wheel and recirculates back through the dehumidifier and continues to control space conditions with minimal or no outside air.

**NOVEL-ICE** with energy recovery is particularly suited to larger arenas where occupancy can fluctuate significantly requiring more ventilation air.

- 2" double wall insulated panel construction
- NovelAire proprietary high performance desiccant wheel
- 410A refrigerant, scroll compressors
- Low maintenance direct drive fans/VFDs
- Microprocessor control with BMS interface
- Winter heating options- gas, hot water, steam
- ETL and cETL listed

## ENERGY SAVINGS WITH NOVEL-ICE

The **NOVEL-ICE** unit relies on a high efficiency refrigeration cycle and uses waste condenser heat to regenerate the desiccant wheel. The heat for regeneration is essentially free. Conversely, a gas fired dehumidifier uses a high temperature flame to regenerate the desiccant wheel. The cost of natural gas to operate the unit is substantial. Similarly, electrically regenerated desiccant dehumidifiers use excessive power to create the heat necessary to regenerate the wheel. Consequently, the cost to remove a lb of moisture with a gas fired or an electrically regenerated dehumidifier is substantially higher than the **NOVEL-ICE** unit as the following chart shows. And, as the outside temperature drops, more gas is required to maintain a regeneration temperature so the operating cost differential increases. In addition, NG and electric dehumidifiers increase the supply air temperature more than **NOVEL-ICE** units. In the summer and shoulder months when outside temperatures are mild, NG and electric dehumidifiers put additional load on the ice plant consuming even more energy in order to maintain proper arena conditions.



Basis: \$1/therm, \$0.1/kwh

### **NOVEL-ICE Advantages**

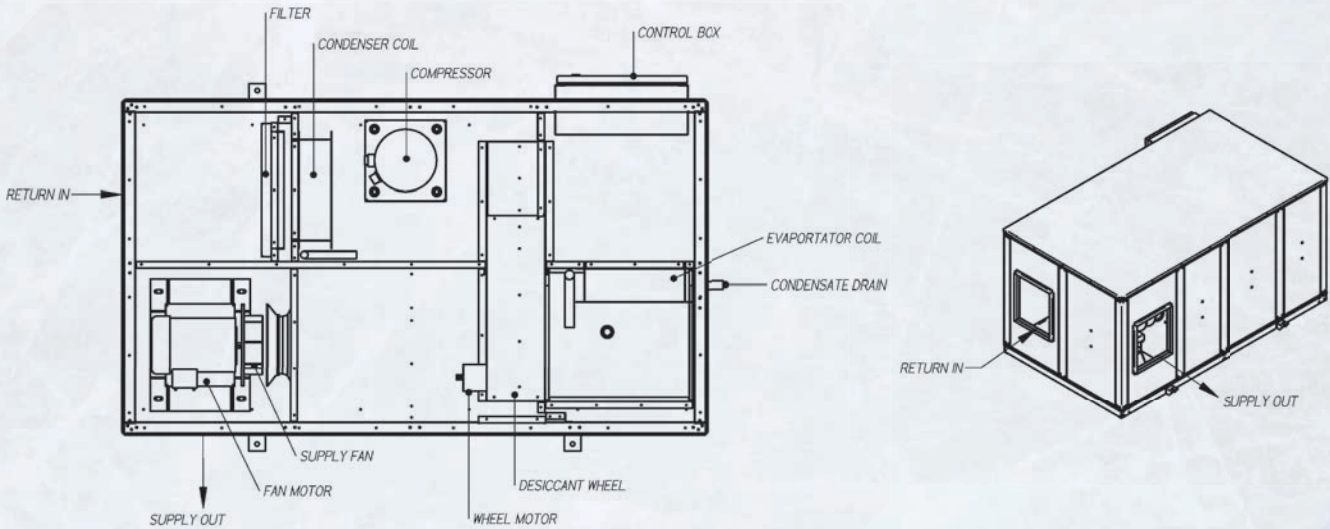
- Uses waste condenser heat for wheel reactivation
- Combines high efficiency DX with desiccant dehumidification
- Up to 35% energy savings compared to NG dehumidifiers
- More than 70% energy savings compared to electric desiccant units
- Defrost cycle is not required
- Simple, uncomplicated design, ease of use
- Integration with the ice plant is not required

# LARGE UNIT SPECIFICATIONS

## NOVEL-ICE

Unit/CFM	Dimensions (in) L x W x H	Weight lb	Compressor (tons)	Unit KW	Water Removed(lb/h)	Supply Air DB/DP (F)	FLA 460/3/60	FLA 575/3/60
NOVEL-ICE 6000	120 x 81 x 81	5400	15	14.7	42	70 / 27	49	40
NOVEL-ICE 8000	138 x 87 x 95	7200	20	19.1	62	70 / 26	58	47
NOVEL-ICE 10000	156 x 90 x 111	9000	25	23.9	70	70 / 26	75	61
NOVEL-ICE 12000	156 x 101 x 111	10800	32	31.2	83	70/ 27	99	80

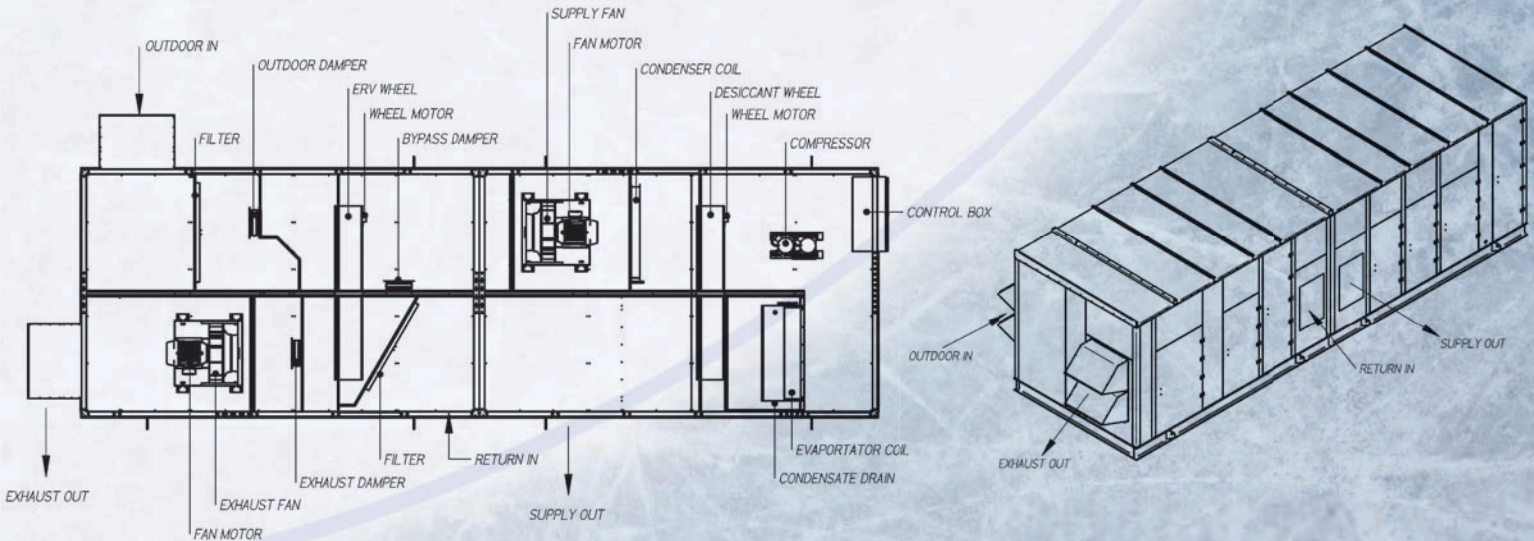
Basis: RA 55F/32 gr/lb, 100% RA



## NOVEL-ICE with Energy Recovery

Unit/CFM	Dimensions (in) L x W x H	Weight lb	Compressor (tons)	Unit KW	Water Removed(lb/h)	Supply Air DB/DP (F)	FLA 460/3/60	FLA 575/3/60
NOVEL-ICE 6000 ERV	252 x 81 x 81	9600	15	15.1	144	72 / 29	64	53
NOVEL-ICE 8000 ERV	252 x 87 x 95	12800	20	20.5	183	71 / 28	77	62
NOVEL-ICE 10000 ERV	288 x 90 x 111	16000	25	25.0	241	71 / 29	101	83
NOVEL-ICE 12000 ERV	288 x 101 x 111	19200	32	32.3	288	72 / 29	132	108

Basis: RA 55F/32 gr/lb, 30% OA, 80F/120 gr/lb





# NOVELAIRE® TECHNOLOGIES

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