

# DEHUMIDIFIERS FOR LARGE CAPACITY APPLICATIONS



DESERT AIRE's ND/SA Series dehumidifiers offer you complete humidity control solutions for large commercial natatoriums, YMCA/YWCA and school and university indoor swimming pool applications. Our many options allow you to control temperature and humidity while conserving energy for significant operational savings. Rely on Desert Aire for expert solutions to large capacity humidity problems.

DEHUMIDIFY WITH THE EXPERTS ... 

# DESERT AIRE'S ND/SA DESIGN

## LARGE SELECTION

DESERT AIRE has a complete line of large commercial and industrial dehumidification systems designed to solve the toughest humidity and moisture problems. These systems remove between 55 and 340 Lb/Hr (25 to 155 Kg/Hr) of moisture.

## DUAL CIRCUIT DESIGN

The Natatorium Dehumidifier (ND) Series is a dual refrigerant circuit, packaged dehumidification system that is carefully designed and manufactured for commercial natatoriums, such as: high school and university indoor pools, YMCA/YWCA, JCC and municipal natatoriums.

Select Aire (SA) Series equipment uses the ND Series as its base design but features an exclusive exhaust air heat recovery system and patented air flow balancing. The SA system effectively addresses exhaust air energy loss in a natatorium and recovers it more efficiently than any other heat recovery method including economizer systems.

These dehumidification systems feature a unique dual refrigerant circuit design which allows staging to minimize energy consumption and optimize energy recovery by using different condensing elements, for the appropriate heat sinks.

At the heart of each circuit is a scroll compressor providing high performance and long life. The dehumidification section features an 8-row evaporator coil for high moisture removal capacity. The energy recovery section can have a combination of air reheat coils, water (pool or domestic) condensers or remote condensers. Auxiliary heat and a fresh air module can also be incorporated to complete a total system design.

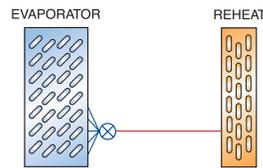
All metal frame and panels use a special corrosion resistant galvaneal metal with a powder coat finish, a tough coating that resists rusting. This process meets a corrosion resistance specification of 1,000 hours of salt spray.

The ND/SA Series dehumidifiers can be installed either indoors or outdoors. Units intended for outdoor installation are factory equipped with additional insulation, heavy duty weather sealing and special rainhoods mounted on the ventilation air intake. They can also be installed on roof curbs (supplied by others) which permit bottom return and supply air to meet HVAC design specifications when required.

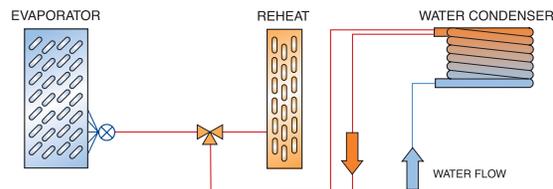
## FEATURES

DESERT AIRE's commercial dehumidifier systems are flexible in their design options. This modular concept allows each system to be customized for specific dehumidification applications. Each module type is described below.

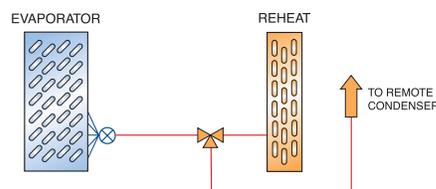
**REHEAT ONLY...** This is the basic option which removes moisture from the air at the evaporator coil and reheats it before returning to the space as dehumidified air.



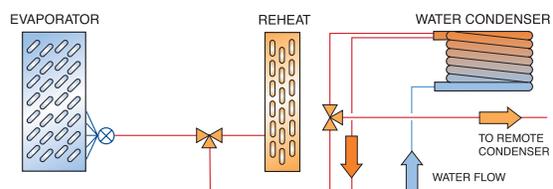
**REHEAT & WATER ...** In addition to the reheat coil, a water condensing coil is added to the circuit. Either circuit can become the primary heat sink allowing the circuit's latent and sensible heat to be directed to a water source or returned to the air.



**REHEAT & REMOTE CONDENSER READY...** This is very similar to the second method described above except that instead of sending recovered energy to a water heat sink, the energy is rejected to an outdoor condenser.



**REHEAT & WATER & REMOTE CONDENSER READY...** This is the combination of all heat sink options. It is used when only a partial water heat sink is available but full capacity dehumidification is required continuously, regardless of season.



# COMPLETE ENVIRONMENT CONTROL

## AUXILIARY HEATING

A dehumidifier is typically the only air handler used in natatorium or industrial applications. Even though recovered energy is sent to the space during the dehumidification process, the heat loss of the space can be greater. Auxiliary heating may be required. This can be added to the dehumidifier to provide complete environment control in one package. Several types of auxiliary heaters are available depending on availability of local utilities.

**HOT WATER COIL...** Specify the required heat output, water temperature and flow rate. The dehumidifier controller will send a 4-20 MA (or other variable control voltage) to a modulating control valve. The valve is sized and provided by others. If the ventilation air option is selected, a freeze-stat is added to protect the coil.

**STEAM COIL ...** Specify the required heat output and steam pressure. The dehumidifier controller will modulate the steam in the same manner as the hot water coil described above. The control valve is supplied by others for field installation.

**ELECTRIC COIL ...** Specify the required heat output and how many stages the coil is to be designed for. The ND Series controller will provide contact output signals for each stage.

## VENTILATION AIR

Every commercial pool requires the introduction of outdoor ventilation air during occupied times. Refer to DESERT AIRE Technical Bulletin #5 for a detailed summary of the code requirements. DESERT AIRE offers four options to integrate ventilation air into the dehumidification package. The dehumidifier blower will act as the ventilation fan and supply air blower.

When any of the ventilation options are specified, DESERT AIRE adds a modulating damper to the evaporator coil section to provide automatic air balancing.

Even if outdoor air is preheated, it should always be introduced downstream of the evaporator coil. Cold air will lower the unit's dehumidification capacity. Return air is filtered and a modulating motorized damper installed for the introduction of outdoor air as follows:

- ◆ O/A PER CODE (OCCUPIED)
- ◆ O/A PER CODE (EVENT) - OPTIONAL
- ◆ CLOSED (NON OCCUPIED)

**DUCT CONNECTION ...** For indoor units of the ND Series, this option provides duct flange connections for introduction of the outdoor air between the coils. Filter, dampers and exhaust blower are provided by others.

**INDOOR DAMPER/FILTER ASSEMBLY...** This ND option can be added to provide integral control of ventilation air. During unoccupied times the damper is closed. During normal natatorium usage the damper is opened to the minimum code position. During high spectator times, the damper is further opened to a higher ventilation rate. The exhaust system is provided and installed by others and must also have a multi-speed motor to match minimum and maximum ventilation capacities. DESERT AIRE's modulating evaporator damper automatically readjusts air flow across the evaporator coils to maintain proper design velocity.

**OUTDOOR DAMPER/FILTER ASSEMBLY ...** In outdoor installations a rain hood and bird screen are included, but the operation remains the same as the indoor assembly as described above.

**SELECT AIRE ...** The Select Aire control system simplifies air balancing while maintaining the correct proportions of return air, supply air, exhaust air and outdoor air. The system works by monitoring the static pressure difference across three major components: the reheat coil, evaporator coil and exhaust blower. The pressure difference is directly related to the quantity of airflow through each of these components. The control system then modulates several dampers in response to the pressure readings.

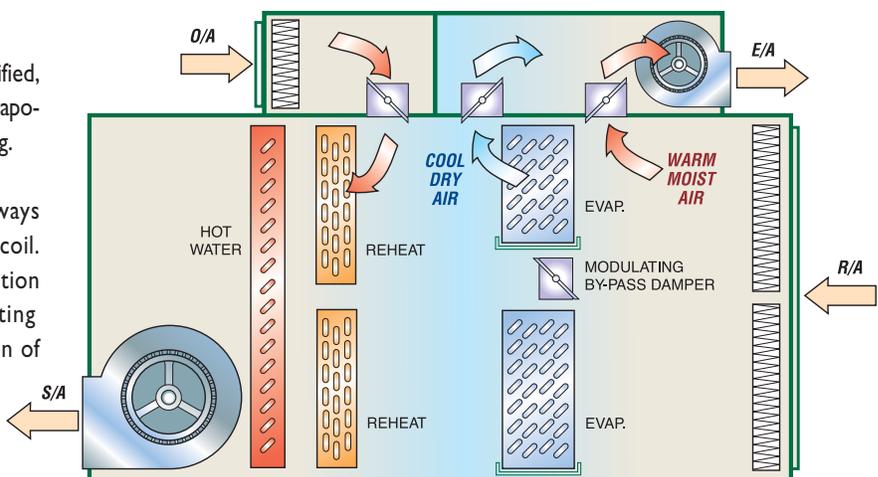


Figure 1 - Select Aire system in winter recovery mode.

# CONTROLS AND CIRCUIT DESIGN

The special design of the Select Aire option allows the controller to follow basic thermodynamic principles:

- ◆ In the heating mode, air is exhausted after the evaporator coil recovers its energy. (Discharge air at its coldest point.)
- ◆ In the cooling mode, air is exhausted before the evaporator coil which is warm and humid. (Discharge air at its warmest point.)

Select Aire systems have two exhaust air dampers. One is upstream of the evaporator coil and one is downstream.

The controller uses the above principle to open the correct exhaust air damper. A third damper is further downstream and allows the introduction of filtered fresh outdoor air.

The Select Aire system uses the principle of a heat pump to recover energy in the heating mode by operating one of the dual compressors in conjunction with exhaust air.

Exhaust air consists of two energy components: sensible and latent. The cold evaporator coil absorbs both of these components and adds the heat of compression of the single compressor. This option provides high COP efficiency to the exhaust air recovery cycle.

During unoccupied times, the exhaust and fresh air dampers are closed and the compressor reverts back to humidity control. For a more detailed analysis, please refer to *DESERT AIRE Technical Bulletin 6 - Select Aire Heat Recovery System*.

## CONTROLS

Each circuit is controlled by the integral microprocessor-based controller. This system provides an easy-to-read interface module which can be mounted either with the dehumidifier or remotely.

The use of the basic control and staging sequences provides great flexibility in optimizing dehumidification and energy recovery capacity.

The system features control of all of the dehumidification functions including auxiliary heating, occupancy schedules and ventilation air. It also provides diagnostic readouts and alarms.

## TYPICAL CIRCUIT ARRANGEMENT

A typical arrangement for an Olympic-size natatorium pool is illustrated in Figure 2.

One circuit uses the option code “W” which either recovers the energy to the air or water. Only one circuit is generally required to replace the heat loss of the pool water.

The second circuit uses the “C” option which allows the system to recover energy and return it to the space in the winter but reject the heat for cooling in the summer.

## EXAMPLE

Through the use of dual circuiting, DESERT AIRE can better control the recovery of energy and optimize compressor run time. The dual circuit design also allows simultaneous rejection of heat to water and air to provide zero reheat. It also allows full heat recovery through its respective and dedicated condensers that are “independent.” In other words, DESERT AIRE’s exclusive dual refrigeration circuits offer you the best of both worlds – simultaneous or independent heat rejection capability for unsurpassed versatility for any operational sequence. Other circuiting options are used to obtain different results. For example, circuit two could have added an “M” option to provide recovery to domestic water when required.

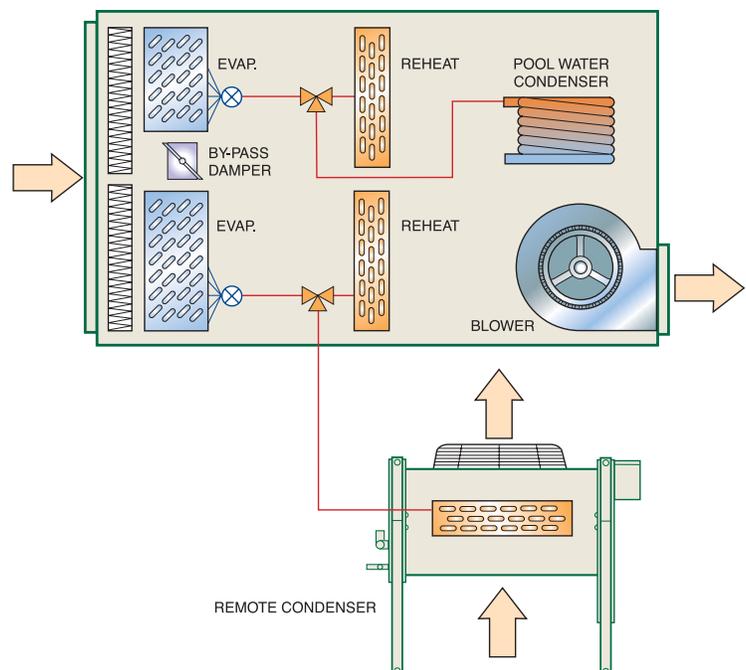


Figure 2 - Typical Select Aire circuit arrangement.

# ND/SA SERIES FEATURES AND OPTIONS

## STANDARD ND/SA SERIES FEATURES

### Refrigeration Design

- ◆ dual, independent refrigeration circuits operate independently or simultaneously
- ◆ heavy-duty scroll compressors
- ◆ maximum of 38" height ensures prevention of water blow-off
- ◆ each coil supplied with its own sloped, stainless steel drain pan
- ◆ minimum of 8" separation between evaporator and condenser coils prevents re-evaporation
- ◆ coils a minimum of eight (8) rows deep
- ◆ R-410A standard refrigerant

### Cabinet and Construction

- ◆ base rails and supports constructed of 12-gauge steel channels
- ◆ top and removable side panels made of 16-gauge Galvanneal steel with powder-coat paint
- ◆ panels rated for minimum of 1000-hour salt spray test
- ◆ thermal and sound insulation made of engineered polymer cell foam (EPFI)

### Blower

- ◆ made of galvanized steel and mounted on permanently lubricated, sealed bearings
- ◆ motor available as ODP (indoor) and TEFC (outdoor)

### Filters

- ◆ R/A on all ND/SA units is filtered using 4" deep, MERV 8, pleated filters
- ◆ optional outdoor air on ND/SA 18-30 ton units is filtered by 2" deep, MERV 8, pleated filters
- ◆ optional outdoor air on ND/SA 35-60 ton units is filtered by 4" deep, MERV 8, pleated filters

### Electrical Service

- ◆ hinged electrical panel on single side access of unit
- ◆ single point power connection for all units

### Controls

- ◆ duct-mounted temperature and humidity sensors
- ◆ display module can be portable, remote mounted or unit mounted

### Warranty

- ◆ all components warranted for two (2) years from date of shipment.

## ND/SA SERIES OPTIONS

### Coils

- ◆ coils and fins coated with Electrofin E-Coat to resist chemicals and corrosion

### Auxiliary Heat Options

- ◆ hot water coil supplied downstream from hot gas reheat coil
- ◆ steam coil supplied downstream from hot gas reheat coil
- ◆ electric heating coil supplied downstream from hot gas reheat coil

### Installation Location

- ◆ indoor
- ◆ outdoor
- ◆ rooftop

### Remote Air-Cooled Condenser

- ◆ auxiliary air-cooled condenser rejects excess heat to the outdoors (full THR - Total Heat of Rejection)

## SELECT AIRE (SA) SERIES FEATURES

### Ventilation Air - Heat Recovery System

- ◆ exhaust air taken before or after evaporator coil depending on heating or cooling
- ◆ heating – energy recovered from exhaust air and delivered as sensible heat
- ◆ cooling – warm return air exhausted before evaporator coil
  - removes maximum heat
  - discharges highest enthalpy to maximize cooling efficiency
- ◆ exhaust achieved by integral centrifugal blower
- ◆ proportional modulating damper between evaporator coils ensures proper face velocity and system efficiency in all modes of operation
- ◆ SA uses “heat pump” principle to recover energy in heating mode by operating one of the dual refrigeration circuits in conjunction with exhaust air



Select Aire Box Details



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WITH THE EXPERTS!**

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Select Aire System with Multiple Circuits

**All referenced publications available as PDF files at [www.desert-aire.com](http://www.desert-aire.com).**

- ◆ **Technical Bulletin 5**  
**Ventilation Air for Indoor Pools**
- ◆ **Technical Bulletin 6**  
**Select Aire Heat Recovery System**
- ◆ **Technical Bulletin 7**  
**Indoor Pool Dehumidification**  
**Analysis & Comparison of Current Methods**
- ◆ **Application Note 10**  
**Swimming Pool Dehumidifier Sizing**