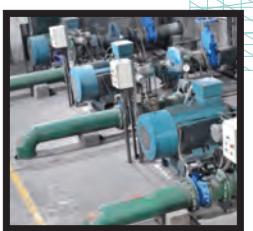
LT AIRE™ by Desert Aire

Low Temperature Moisture Removal

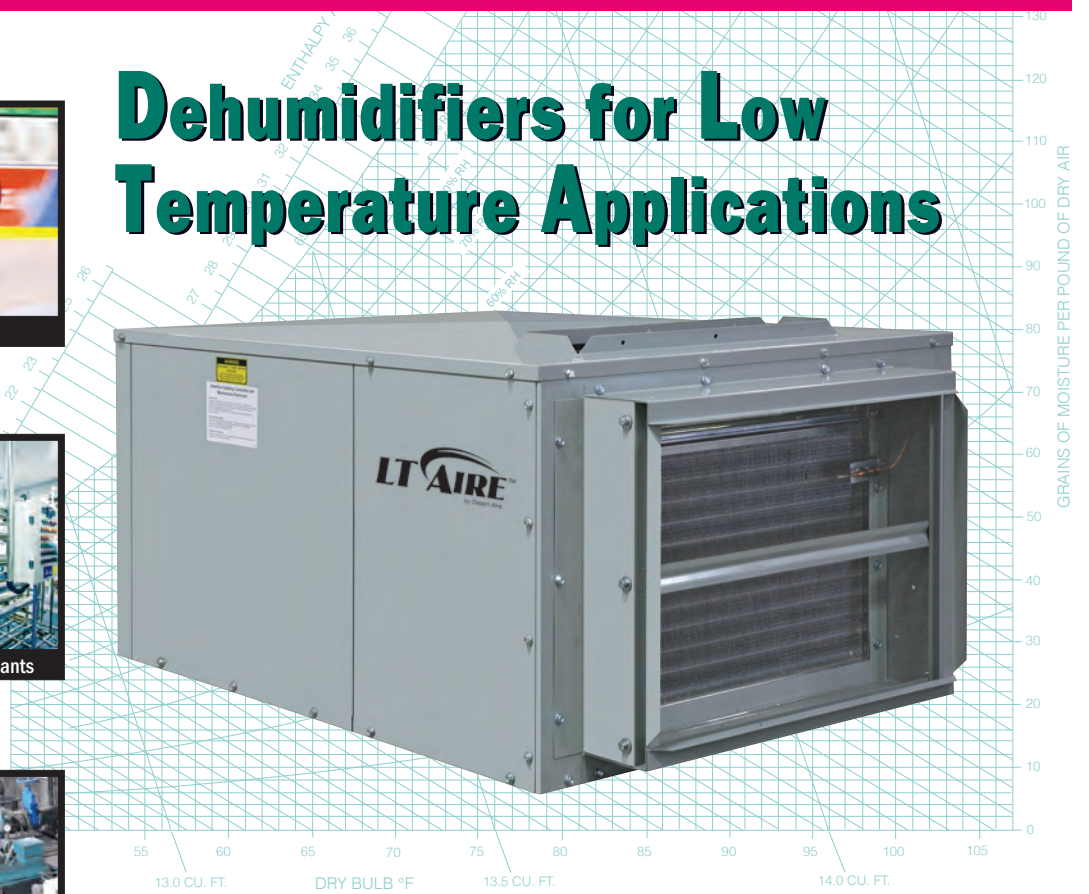
Dehumidifiers for Low Temperature Applications


Ice Rinks


Water Treatment Plants


Pumping Stations


Food Storage & Processing



It is well published that a refrigeration based dehumidification system works best under high ambient temperature conditions (65 to 95°F, 18 to 35°C; 50 to 80% RH). What is not understood is that these dehumidifiers can be reconfigured to remove moisture at low temperature applications (32 to 70°F, 0 to 21°C) as well.

In a refrigerant based dehumidifier, the evaporator coil is cooled to below the dewpoint of the air, thereby condensing moisture on the coil. A typical dehumidifier for high ambient design utilizes a hot gas bypass feature to insure the evaporator coil temperature never drops below 32°F (0°C), since below this point the condensing liquid will immediately freeze on the evaporator and eventually cause a system failure. In general, hot gas bypass is activated anytime the entering air drops below a 55°F (13°C) wet bulb temperature (e.g.: 60°F/60% RH) because at this condition the coil leaving air temperature will go below 32°F. In practical terms, as the load drops, the hot gas bypass feature increasingly reduces the performance capacity of the dehumidifier to the point where no moisture will be removed even though the compressor is running. At these conditions, a strain is put on the compressor because large amounts of hot gas refrigerant are short cycled back to the compressor suction .

Optimizing Solutions Through Superior Dehumidification Techology

DESERT AIRE
POOL DEHUMIDIFICATION
DEDICATED OUTDOOR AIR SYSTEMS

Dehumidification Solutions

In order for a dehumidifier to continue to remove moisture without shortening compressor life (continuous hot gas bypass), the evaporator coil temperature must be allowed to drop below 32°F (0°C). As the temperature drops, ice will form on the coil which will restrict the airflow. At some point, the coil must go through a defrost cycle to melt the ice allowing it to drain properly while eliminating the air restriction in the evaporator.

Amounts of ice build-up are a function of air temperature and it's corresponding relative humidity. Low temperatures when coupled with high humidity will frost up the evaporator quickly.

Dehumidification Design

The LT Series dehumidifiers combine numerous design features into a cost competitive system that removes the unwanted moisture problem in low load situations.

Desert Aire starts with an evaporator coil designed specifically for low ambient moisture removal and then adds appropriate refrigerant components to insure long operating life.

Each LT System is equipped with an adjustable timer which will initiate the defrost cycle (if it is needed). The need to defrost is determined by monitoring the suction line temperate and activating the defrost when it drops below 30°F (-1°C). During the defrost cycle, the blower is disengaged and 100% of the system's heating capacity is diverted to the evaporator where it quickly thaws the coil. The defrost cycle is monitored and automatically terminates when suction line temperatures confirm that the evaporator has fully thawed. There is an additional safety timer which limits the total defrost time to 10 minutes.

LT dehumidifiers generate increased air volumes to assist in a "blanketing effect" that provides the required air turns for the facility's design.

Control

There are two control choices. The basic design rejects all of the heat recovered during the dehumidification process back to the space. The space must have the ability to handle this heat gain. In ice rink applications, the ice refrigerant system is normally able to accept the small additional load. In this control type, a humidistat is installed in the facility and utilized for control of the unit's compressor operation. As relative humidity increases past the setpoint, the dehumidifier's compressor is energized to remove unwanted moisture. Blowers run continuously (with the exception of the short defrost cycle) to eliminate false loads created by air stagnation.

If the facility cannot, at times, accept the recovered heat, then an optional remote condenser must be installed outside to provide the full cooling capacity. In this mode, a thermostat is also installed in the facility. If the air temperature should exceed the desired set point, the controller will shift the dehumidifier from the reheat mode and reject all of the energy to the remote condenser, thereby providing sensible cooling to the space.

System Ratings

To achieve proper unit selection, you must make your selection based on operating conditions and required moisture removal capacity using reference curves provided. Note that these curves provide average values which account for defrost cycles (with the timer set for 30 minutes). Consult the factory for improved performance ratings if longer time cycles are employed. Depending on the load, systems may defrost for up to 15 minutes per hour.

Ice Rink Applications

Applications such as ice arenas present unique challenges to a building's design as well as it's HVAC system. These structures must maintain low ambient temperatures to insure consistent ice quality. Cold air by its nature does not hold much moisture. When a hockey game or skating event is occurring, moisture is released to the area from the participants and spectators. Problems such as fog, roof and wall condensation and unsatisfactory "soft" ice conditions are common during occupied times.

The goal of the HVAC system for an ice arena is to keep the ambient air temperature low enough and maintain a dew point below that of the enclosures walls temperature. Refer to Desert Aire Application Note #13 for a detailed analysis of dehumidifier sizing.

Water Treatment Plant Applications

In the northern United States and Canada, raw water temperatures of treatment plants can approach 32°F (0°C). Therefore, the treatment facilities and pumping stations must continue to remove damaging moisture under low ambient conditions.

The LT Series dehumidifier can continue to operate by using its frost/defrost cycle to eliminate the moisture in the winter or summer. This provides an economical alternative, both from a capital cost and energy savings perspective, to chemical based dehumidifiers. Please refer to Desert Aire Application Note #12 for details on sizing the dehumidifier.

Food Storage & Processing

Many food products can spoil under high humidity conditions when stored in an unconditioned space. The facilities themselves also can develop mold and mildew problems from the moisture released by the product. The LT Series dehumidifier is ideal for removing excess moisture under low temperature conditions. Refer to Desert Aire Application Note #11 for a detailed analysis of dehumidifier sizing.

N120 W18485 Freistadt Road, Germantown, WI 53022 sales@desert-aire.com

Ph: (262) 946-7400 - www.desert-aire.com

DESERT AIRE
POOL DEHUMIDIFICATION
DEDICATED OUTDOOR AIR SYSTEMS