# Artifact Preservation & Archival Storage

## DESICAiR® Desiccant Dehumidification

### The Problem

Museums and galleries provide access for all to enjoy treasures of the past. In addition to the exhibits, there are usually many more artifacts in storage. Many of these treasures are priceless and irreplaceable. Archives and Libraries also store sensitive items which may range from court records to rare book collections. Unfortunately, many of these displayed or stored items are also fragile and have a limited life span. Deterioration of books, photographs, art, furniture, and documents can be caused by improper temperature and humidity conditions. Nitrate films can actually combust if not stored correctly.

Proper storage conditions can greatly extend the life of these items. Experts recommend storing most items in a cool and dry environment. Depending on the item being stored, recommended conditions may be below 40F and 20%, which is a 5F dewpoint. Typical HVAC equipment is not capable of reaching or maintaining such conditions. Refrigerant dehumidifiers rely on condensation to remove moisture from the air. While this may be effective at dewpoints above freezing, frost or ice on cooling coils becomes a problem with freezing temperatures. Once freezing takes place, dehumidification capacity is reduced or lost as the refrigerant dehumidifier coils must be defrosted. Defrost cycles are inefficient, using energy to heat the coil and causing higher dewpoint temperatures leaving the coil.

### The Solution

DESICAiR® desiccant dehumidification systems can meet the low dewpoint requirements of artifact and archival storage. The desiccant dehumidification process does not rely on condensation as in refrigerant systems. DESICAiR® utilizes silica gel desiccant to remove water vapor from the air. Desiccant dehumidifiers are effective even with sub-freezing dewpoints. Defrost cycles are not required, so there is no interruption in the supplied air conditions.

The result is dry air which can be cooled to the required temperature, regardless if it is below freezing.

DESICAiR® desiccant dehumidification systems are currently providing optimum storage conditions at such locations as the Library of Congress's National Audio Video Conservation Center, Smithsonian Museum, and University of Virginia special collections library.

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## DESIGN CONSIDERATIONS FOR DEHUMIDIFICATION

Only DESICAiR® has the H-Trac® control scheme. H-Trac® relative humidity control compares the conditioned space relative humidity to the desired relative humidity setpoint. Reactivation energy is modulated to provide the proper supply air moisture content to satisfy the setpoint. When loads are less, the reactivation energy is reduced, thereby lowering utility consumption. Unlike some control methods which may waste energy to "over dry" the desiccant rotor and bypass air to bring the supply air conditions to desired levels, H-Trac® uses only the amount of reactivation energy required to maintain the relative humidity setpoint. During periods of no load, the reactivation can be programmed to turn off to further save energy. Specific humidity setpoints can also be maintained using the DESICAiR® Dew-Trac® control. This functions the same as H-Trac®, but uses a dewpoint setpoint rather than a relative humidity setpoint.

DESICAiR® desiccant dehumidifiers can use electric, steam, propane, or natural gas for reactivation. Units can be configured for indoor or outdoor installation. Cooling and heating options are available to provide complete environmental control of the facility. High efficiency filtration and gaseous phase filtration are also available.

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