

DESICCANT DEHUMIDIFICATION BEATS HEAT AS CONSTRUCTION DRYING METHOD

by Russ Brown

Moisture within a building under construction can become a real headache to contractors and a danger to its future occupants.

All construction materials inside the structure absorb moisture, including wallboard, fireproofing, lumber, block, and concrete. Unless that moisture is reduced to acceptable tolerances, the condition can delay the construction timetable or, even worse, cause performance failure of some material or lead to the formation of mold.

Surfaces often include freshly sprayed fireproofing, joint compound, concrete slabs, floor leveling products, concrete block walls, and stored building materials. Water-laden fireproofing and joint compounds dry slowly inside closed areas when applied. Often, the humidity that results can encourage mold contamination. Finished flooring products such as vinyl composite tile and fiber-backed carpet are applied with adhesives extremely sensitive to moisture. Without proper drying, large amounts of water can be trapped in concrete, preventing the installation of flooring. Hardwood flooring and trim absorb moisture easily, causing warping.

Contractors generally use one of two methods to accomplish drying during the construction of commercial, educational, industrial, and high-rise residential buildings—direct-fired heaters or desiccant dehumidification systems.

Some contractors also attempt to dry by using the HVAC system, but that has been proved highly ineffective. HVAC systems are engineered for temperature control and not moisture removal capacity. Running the blowers can spread dust and mold spores throughout the ventilation system and even cause damage to the HVAC equipment, coils, or filters. And using HVAC prior to commissioning the building can lead to warranty issues and concerns. Because of these reasons, some building owners no longer allow the use of the HVAC system during construction.

Russ Brown is national accounts manager with Munters Moisture Control Services, Indianapolis, Indiana. He can be reached at russ_brown@munters.com. This is his first article for Facilities Manager.



Desiccant dehumidification underway at an elementary school construction site near Austin, Texas.

The issue of which drying method is best is no longer open to debate by some professional trade groups. The Northwest Wall and Ceiling Bureau (www.nwcb.org) is a professional trade association that serves contractors, manufacturers, dealers, and labor. Regarding wallboard, for example, NWCB states in its technical bulletin #303: “Cold damp weather contributes to joint bond failure, delayed shrinkage, ridging, nail pops, joint flashing, and board sagging. Proper temperature and humidity levels (environmental conditions) are important factors in achieving satisfactory results. Some sources of temporary heat will cause high humidity. The NWCB recommends a desiccant dehumidification system for best results in joint finishing and final decoration of gypsum wallboard.”

‘Proper Drying’ Defined

A key factor is “proper drying.” Principles of physics dictate that simply introducing heat into a building space is not an effective method to dry the air. Conventional HVAC systems are not designed to dry out construction-related moisture. The moisture load from wet materials is simply too large and the drying task too complex for systems that are intended for comfort.

In uncontrolled atmospheric conditions, water molecules that exist in the air exert vapor pressure on the materials of which it comes into contact. The warmer the air, the more water vapor is present.

Permeable materials—and that includes almost everything inside a building—absorb water vapor to differing degrees.



A mixture of desiccant dehumidifiers and indirect fired heaters is powered by a propane-fueled generator to operate the heaters and the blower fans, eliminating the need for an electrical connection.

Unabated, that process will continue to the point that Equilibrium Moisture Content (EMC) is reached, when the material neither gives up nor takes on moisture from the surrounding air. By lowering the vapor pressure between the material and the ambient conditions around it, the material will begin to give up moisture.

Moisture will travel from areas of high vapor pressure within the material to the areas of lower vapor pressure surrounding it, which are being mechanically created. The moisture vapor will be desorbed from the material into the air and will be pushed out of the space by air movement.

The Problems Using Heat

While heat can act to temporarily reduce relative humidity, it does not reduce vapor pressure. The process is not effective at significant moisture removal. In fact, heating the space with standard direct-fired construction heaters often will add moisture to the space, through combustion, which may compound the problem.

Using the traditional method of heating with direct-fired heaters, it is often difficult to maintain conditions that minimize formation of mold or mildew. As a result, humidity rises, allowing condensation to form on surfaces throughout the building interior, such as metal studs and wallboard.

Direct-fired heaters generate initial air temperatures of about 150°F. The heated air is pumped into the structure at about 95°F, where it rises to the ceiling.

As the heated air cools, moisture again is released into the atmosphere. The atmosphere can be compromised further because buildings under construction usually have openings that allow moist outside air to infiltrate the indoor environment.

Another negative is the high cost of fuel and labor to operate direct-fired units. The boilers consume comparatively large quantities of propane or natural gas to generate high temperatures. And, more intensive labor is required to frequently refuel.

Safety also is an issue. Often, fire codes preclude the use of the units in high rise construction because they involve an open flame. A typical example would be a 30-story multi-use structure in which the lower half of the floors already are occupied by businesses, while the upper floors are being completed for residential use.

Direct-fired heaters are recommended in applications in very cold climates where a lot of heat is required and in non-enclosed areas such as general construction, ventilated warehouses and parking garages.

Desiccant Dehumidification

The more efficient, productive, reliable, and faster method of moisture abatement is aggressive drying through a desiccant dehumidification system. Desiccant dehumidifiers have proved effective to create low relative humidity and dew points when drying air at a condition far from saturation or at low temperatures.

Desiccant units used for drying are different than those used as permanent installations in commercial buildings. Portable units, delivered to the site on trailers, are designed to withstand the construction environment and to provide the drying capacity required to establish and maintain proper atmospheric conditions.

Providing powerful tools for FM professionals & organizations to turn business goals into realities	<ul style="list-style-type: none"> • Organization assessment and positioning • Strategic sourcing options evaluation • Marketing plan formulation and implementation • Customer service programs • Strategic planning • Customized training • Market research • Due diligence
---	---

THE FRIDAY GROUP[®]

MANAGEMENT, MARKETING & FACILITIES CONSULTING

198 West Street, Annapolis, Maryland 21401
410.268.4300 - www.thefridaygroup.com

Portable, inflatable plastic ducts are used as part of the airflow system, precluding any reliance upon the HVAC distribution system. Also, the temporary ducts can be moved easily as work progresses to other areas of the construction site. To be effective, the dry air must be contained. If a building under construction is open to the exterior, temporary enclosures may need to be erected to contain the dry air where needed.

Unlike cooling-based dehumidifiers, which cool the air to condense moisture and then draw it away, desiccants attract moisture molecules directly from the air and release them into

an exhaust air stream. Desiccants can attract and hold from 10 to more than 10,000 percent of their dry weight in water vapor. They are effective in removing moisture from the air at low humidity levels and do not freeze when operated at low temperatures. The end result is an extremely dried air source capable of drying the most saturated materials.

Depending on the amount of moisture to be removed and the conditions present, the number of hourly air changes to be effective can vary greatly. Air change rates can fluctuate depending on ceiling height, tightness of envelope, type of vapor barrier or lack of one, outside weather conditions and other variables.

Trades workers can continue to work in the spaces being dried. However, they must be informed not to tamper with equipment, fans, or ducts. They must keep the "envelope" secure by closing doors and windows. If possible, the best results are achieved when work is limited in an area being dried.

In summer applications, one might consider combining temporary cooling systems in conjunction with the desiccant dehumidification to provide more comfortable working conditions for the workers while still creating the perfect drying conditions.

The Issue of Mold

Mold and fungus are present in almost all materials in educational, residential, commercial, industrial, and municipal structures. For example, just one square-inch of surface on drywall may contain from one to 10 million spores.

In order to grow, mold requires air, suitable temperatures and a moist nutrient. Of those, moisture is the major contributor as a "food medium" that sustains mold. The moisture does not need to be in liquid form. Because microscopic organisms need so little moisture, they can use what is present in solid materials, on the surfaces or in the air as condensation or humidity. The key to mold control is moisture control.

In Summary

Heat alone cannot reduce vapor pressure in an interior construction environment. As a result, materials cannot give up the moisture they retain. Because desiccant dehumidification reduces both humidity and vapor pressure, it is the preferred method to dry construction materials. Materials dry in a matter of days, not weeks. The method also reduces the potential for mold growth. And it establishes a more comfortable working environment. 🏠

"Focused On Aquatic Construction and Renovation."

Our Pool Projects Hold More Than Water.

For 20 years, facilities maintenance professionals have turned to RenoSys when they have pool problems. We offer the remarkable RenoSys PVC pool shell liner, our affordable perimeter gutter systems, several styles of PVC grating, and our slip-resistant low maintenance PVC wet area decking. Now through our equipment division, poolequip.com, we can provide you with the finest in Public Pool Equipment @ Competitive Prices. Our unique and time proven products can provide your facility with practical, cost effective methods of enhancing your aquatic facility. Please give us a call when you need answers to your pool problems.



www.renosys.com / www.poolequip.com
 Call us at 800.783.7005 for a free coaster sample

© 1990-2005