

# Reaching that Perfect Climate

## Humidity Control in Commercial Buildings

### AT A GLANCE

- ▶ Importance of Humidity Control Often Overlooked
- ▶ Desiccant Dehumidification Frequently Lower Cost than Reheat
- ▶ During Dry Months, Steam Humidification a Valuable Tool
- ▶ Gas-Powered Humidification a Good Choice

**F**or years, school staff had complained about high humidity in an elementary school building in Georgia. The problem

was finally solved with the installation of a SEMCO rooftop desiccant dehumidification system. The 25-ton unit replaced an existing air handler in an area that had been suffering from serious air quality problems. This experience is being repeated in numerous locations, with natural gas units meeting the challenges of both excessively high and low building humidity levels.

### HUMIDITY: THE OTHER DIMENSION

Comfort specialists have shown that maintaining an appropriate humidity level is the other critical dimension. While total control of humidity is now possible, it's not always understood or achieved. But increasingly, commercial building owners are learning to control humidity with efficient automatic equipment. First, let's consider the options in reducing moisture levels in building air — dehumidification systems.

Dehumidification is desirable for variable lengths of the year for most office buildings, stores, and restaurants. The



A natural gas-fired SEMCO Revolution™ desiccant dehumidification system was retrofitted into this Georgia elementary school.

need depends on the local climate, the building function, internal humidity sources, and the type of building comfort system used. A part of the building humidity load is removed by DX or chilled water cooling coils, but relying on this system for full dehumidification may not be enough. Many types of businesses need additional dehumidification. The reason is that dehumidification needs may not match up with cooling loads.

### CONVENTIONAL COOLING NOT ENOUGH

Often if the building cooling system alone is used to wring the moisture out, building air needs to be super-cooled, then reheated. This means we need to cool the air temperature to a point way below where people will feel comfortable

and then the systems need to reheat the air to a temperature that is more comfortable. Reheat takes place either in the air handler or at the delivery point to avoid overcooling the space. Reheat may be supplied by electric resistance heaters or steam or hot water coils. In any case, it's an energy intensive operation.

An alternative approach is to use modern desiccant dehumidification systems to efficiently wring the moisture from building air at a much smaller energy cost. Desiccant systems use either a dry desiccant (moisture absorbent chemical) material on a rotating medium or a liquid desiccant solution for moisture absorption. The desiccant aggressively removes high volumes of water. The moisture is then efficiently extracted from the desiccant by

heating it and discharging the moisture outside the building.

### ENERGY SAVINGS OVER REHEAT SYSTEMS

Desiccant materials can be reused over and over, and the energy required to operate the system is far less than with a coil-reheat process. Further, the reduction of the moisture eliminates a large part of the latent heat load for the building cooling system, which can be reduced in size or operated at a lower level.

Desiccant dehumidification systems can be applied at various locations in the building air cycle. If, as is commonly the case, the problem comes from high-humidity outdoor air, the dehumidification system can be installed after the makeup air inlet. If the humidity is internally generated and a portion of the return air is recirculated, then that stream can be treated. Some owners have independent ventilation air systems. This stream can also be treated. Because of the high level of moisture removal with desiccant systems, it may only be necessary to treat a part of the building air stream to achieve desired humidity levels.

The principal energy usage in a desiccant dehumidification system is the electric energy to drive the fan, and the heat source to regenerate the desiccant. For small systems, the regeneration energy is often electric resistance heaters. For medium-scale and larger systems, a natural gas burner is commonly used as an energy source.

### CONSIDER FULL COST OF DEHUMIDIFICATION

Desiccant dehumidification is usually significantly less costly to operate than

are super-cool & reheat systems. Although a desiccant system has a higher first cost, the owner needs to also consider monthly system operating costs, plus the likelihood that a desiccant system will allow the cooling plant to be downsized. Desiccant dehumidification is often the lowest total cost.

Desiccant systems are especially popular in facilities with high humidity loads and limited needs for space cooling — for example, ice arenas and swimming pool areas. This type dehumidifier is also often a good choice for commercial areas where condensation on cold items and display showcases would be a problem, for example grocery stores, water treatment facilities, and bottling plants.

An example of a commercial use of desiccant dehumidification is Albertsons Stores, the second largest food-drug retailer in the U.S. Albertsons uses desiccant dehumidification wheels in its grocery stores in the Northeast, the Midwest, and in the South - all areas where there are prolonged seasonal high humidity periods.

According to Glen Barrett, senior manager of demand-side management with the company, they've been using these systems for more than five years. They use a Munters dry desiccant wheel unit on the rooftop, usually piggy-backed on a store air handler. Barrett notes, "In a supermarket, where you have a lot of cold cases and open cases, you often don't want more cold air, you just want dry air." He points out that "A desiccant system exchanges heat for moisture, so you take the moisture out of the air, but at the same time you don't have to cool the air."

Barrett explains that they want to remove the moisture out of the air both for energy savings and also to maintain product quality and appearance. Desiccant systems do both. He notes, "We've verified that through a test where we compared stores with a standard DX system with stores with desiccant systems. We saw substantial savings, more than we anticipated."

For many of the same reasons, desiccant systems are also commonly used in

**Ideal for grocery and convenience stores, desiccant dehumidification units reduce condensation on glass surfaces and food packages. This greatly improves product presentation.**



hotels and healthcare facilities, where there are rigorous standards for environmental control.

### LOW HUMIDITY ALSO A PROBLEM

Excessively low humidity can be as much a problem as high humidity. In many parts of North America, the cold-weather season brings with it plummeting indoor humidity. Winter outdoor air has very low moisture content, and when it is heated, indoor relative humidity levels of 20% or even lower can result. This very dry air can cause skin irritations, dry eyes, “winter coughs” and a wide range of human discomfort. Also, viruses thrive in dry conditions, helping to spread influenza.

### HEATING COSTS CAN BE REDUCED

Further, because of excessive evaporative cooling of the skin, room temperatures need to be higher to maintain the same level of comfort. Additionally, very low humidity can cause deterioration of furniture and other materials, and encourage static electricity discharges, which are irritating and can be damaging to electronic and magnetic media.

The solution in these dry months is a central humidification system. Small sys-

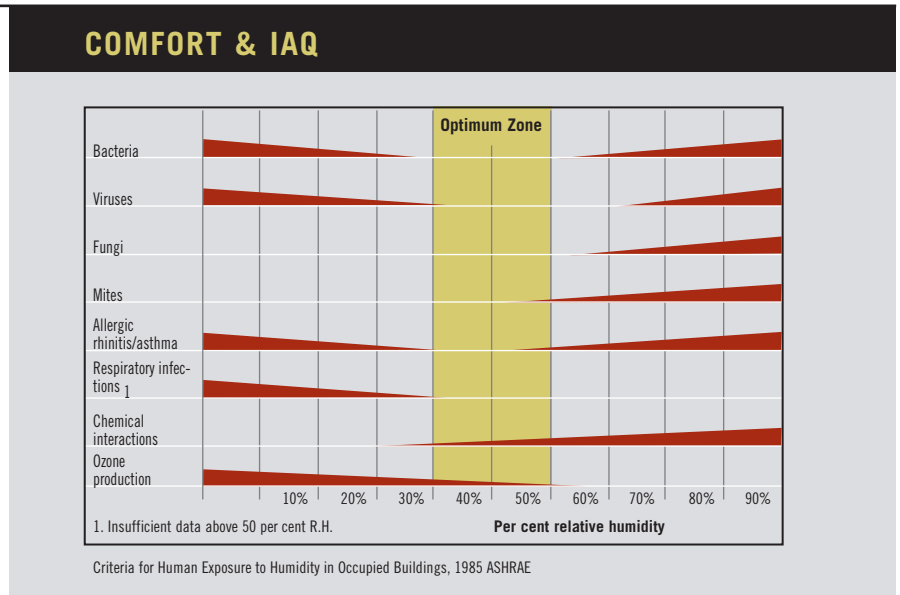


Diagram shows the comfort and health reasons why experts recommend indoor relative humidity levels be held between 40% and 60%.

tems commonly use an evaporative or atomization principle to disperse water vapor in a duct system. However, for the medium to larger volumes and where tighter control is needed, steam humidifiers are more commonly used. These are usually the choice for larger commercial buildings. These can be operated by electric resistance elements, central plant steam, or may have a dedicated natural gas steam generator.

### ELECTRIC UNITS HAVE LIMITATIONS

Electric steam humidification units seem to be prone to mineral buildup and are more costly to operate. Steam powered units may be effective, but they are dependent on the availability of steam from the building boiler, which may include

traces of the chemicals used in the treatment of the boiler water. Often a natural gas-fired unit is the best choice. These are available in a wide range of sizes, and in commercial buildings it is not unusual to have several units. For all humidifiers, a key to successful performance is controlling the build-up of minerals inside the unit, especially in the water tank. Gas-fired units control mineral buildup by using an automated tank blowdown strategy, and in some cases using a replaceable medium in the tank.

Achieving the ideal climate in a commercial building requires a rudimentary knowledge of the challenges, and a willingness to make changes to improve conditions. Fortunately, today there are engineers and manufacturers who can help you achieve that perfect environment.

MORE INFORMATION

#### DESSICANT DEHUMIDIFICATION CONCEPTS AND DESIGNS

[www.conceptsanddesignsms.com](http://www.conceptsanddesignsms.com)

**DRYKOR** [www.drykor.com](http://www.drykor.com)

**KATHABAR** [www.kathabar.com](http://www.kathabar.com)

**MUNTERS** [www.munters.com](http://www.munters.com)

**SEMCO** [www.semcoinc.com](http://www.semcoinc.com)

#### HUMIDIFICATION

**ARMSTRONG INTERNATIONAL** [www.armstrong-intl.com](http://www.armstrong-intl.com)

**CAREL USA** [www.carelusa.com](http://www.carelusa.com)

**DRISTEEM** [www.dristeem.com](http://www.dristeem.com)

**NORTEC** [www.humidity.com](http://www.humidity.com)

**PURE HUMIDIFIER** [www.purehumidifier.com](http://www.purehumidifier.com)

or readers can go to [www.gasairconditioning.org](http://www.gasairconditioning.org) for additional information and suggestions.