THE IMPORTANCE OF MEASURING BUILDING HUMIDITY PART 1

WHITEPAPER

This three part whitepaper series discusses the importance of measuring building humidity levels as it relates to various real world scenarios, health and safety concerns, cost savings, mold prevention and industry best practices for proper sensor selection.

Topics include how to monitor relative humidity (RH) within a building and the consequences of unbalanced humidity levels in real world applications. This series also discusses some potential hazards of failing to monitor humidity properly and what effect that can have on building occupants. Finally, helpful tips are included for selecting the proper RH sensor based the application requirements, along with industry best practices.

1. Application Intelligence & Why Monitoring Humidity is Necessary

Building owners spend a great deal of time and money to improve the productivity, health, and comfort of their occupants. Perhaps the easiest and most cost effective way to accomplish this is by improving the indoor air quality (IAQ) of the building. For indoor air to be considered high quality, it must be properly ventilated, clean air with an RH between 30 and 60%. This range is ideal because it is low enough for occupants to be comfortable, yet there is sufficient humidity in the air to avoid some of the problems associated with dry air.

2. Health Risks & Dangers of Failing to Properly Measure Building Humidity

Studies have shown a statistically significant increase in respiratory infections and absenteeism among occupants of buildings in which humidity is not controlled adequately. The dryness of the winter season will often cause humidity levels to drop below 30%, causing dry eyes, throat, and skin, itching, chapped lips and irritated nasal passages. This low humidity work environment not only causes worker discomfort, but it also increases the susceptibility of employees to colds and other respiratory illnesses, which contributes to employee absence. Furthermore, static electricity shocks can damage computers, printers and other electronic equipment.

When humidity rises above 60% RH, evaporation from surfaces is slow and can result in condensation on windows and in ducts, causing corrosion and decay on furnishings, carpeting

What's Inside

and other building materials. The increased humidity levels also increases the risk of mildew, dust mites, bacteria, and worst of all, mold. These allergens can cause respiratory problems and activate allergies and asthma. RH levels greater than 60% also increase the level of discomfort causing occupants to sweat more easily and often reduces their productivity.

3. Maintaining Humidity in Various Building Environments

While it is important to maintain proper RH levels in office buildings for worker comfort and productivity, it is also just as important to maintain proper levels in factories, production facilities and art galleries to protect industrial, commercial and artistic products.

Paper Operations

High humidity levels have become an ongoing issue in paper, packaging and printing industries. RH above 60% can cause paper to expand and curl, an irreversible damage. When moisture-laden, cardboard swells at the periphery, it becomes unsteady and unsafe for stacking. For printers, uncontrolled humidity can mean poor print quality for magazines, brochures and banners.

Pharmaceutical Manufacturing

Moisture can severely impact pharmaceutical production if it isn't properly controlled. Trace moisture can be absorbed on the surface of drugs, increasing the rate of decomposition and shortening shelf life. In addition, many pharmaceutical tablets are coated and then dried at a specific RH level. Anything above or below that optimum RH level alters drying times, which negatively modifies drug release rates. Moreover, manufacturing pharmaceutical products at extremely high humidity levels can negatively affect product quality, yield and visual appearance.

Robots & Paint Spray Booths

Low or high RH can negatively effect industrial manufacturing as well. For example, in automotive paint spray booths, high moisture content disrupts proper adherence of paint to vehicles. Similarly, robots and other factory floor capital equipment with sensitive electronic circuits require a constant temperature/humidity environment to work properly.

When low RH levels are combined with the movement of people, carts, forklift trucks and automated guided vehicles, can lead to static discharge. This can be damaging to the unit's electronics if transferred from worker to machine.

Testing Facilities

At the other extreme, testing facilities require an extremely wide temperature and humidity range. A wind tunnel, for example, enables testing at temperatures from -40°C (-40°F) to 66°C (151°F) and humidity levels from 0 to 100% RH. This makes it possible for automakers to test how humidity affects drag on a new production vehicle. It's also important that the test chamber delivers the specified temperature and humidity combination.

Museums

It's very important to provide proper humidity and temperature levels at museums, art galleries and historical buildings. Extremes in temperature and humidity can have a harmful effect upon the preservation of artwork and rare documents. High humidity can cause chem-

icals and acids within artwork to break down and compromise the effectiveness of glue in a book binding. Consequently, museums generally keep artwork in a well-ventilated area at a constant temperature and a narrow RH range of 30 to 50% RH.

At the Smithsonian, for example, the current environmental guidelines are 45% RH ±8% RH and 70ºF ±4ºF for exhibitions and storage spaces. These precise levels are maintained by installing numerous temperature and humidity sensors feeding exact measurements into a central control system.

Author Bio:
Frank Caporale joined Setra Systems in 2007 as sales manager, managing outside sales representatives, national/strategic accounts and OEM business opportunities.

Frank brings over 25 years of experience in many areas of the HVAC industry from the A&E field where he was responsible for the system engineering and design of residential, commercial, and institutional projects to the design and installation of building control/energy management systems.

Prior to joining Setra, Frank's experience includes 15+ years in the sensing instrumentation industry where he was responsible for the applications and sales of RH products to various end users and OEM accounts throughout North America. Frank has been involved with many aspects of RH measurement, from engineering specifications, system design and installation, to troubleshooting.

About Setra:
Founded by former professors of Engineering at Massachusetts Institute of Technology (M.I.T.), Setra has been designing and manufacturing sensor products since 1967. Our specialty is in the pressure and sensing in a wide range of markets including HVAC/R building automation, pharmaceutical, energy, medical sterilization, industrial OEM, test & measurement, meteorology and semiconductor.

Setra Creates Solutions:
- Over 40 years of expertise in sensing and sensing applications
- R&D and Design Engineerings focused providing application solutions
- Sensors cover a wide range of pressure rages with unique expertise in low pressures
- Sales and manufacturing in the U.S., Europe, and Asia for fast solutions and products