AirTest™
Sensors That Make Buildings Smart!

Air Test Dew Point Control Solutions

Why Dew Point Measurement

Dew point (abbreviation is T_d) is a measure of the absolute amount of moisture in the air, regardless of temperature. It is called dew point because the value actually predicts at what temperature moisture will condense on a surface. It is an excellent method of controlling humidity because, unlike relative humidity that varies with temperature, dew point provides an indication of moisture or the latent energy content in air and will remain constant regardless of temperature. The ability to accurately measure moisture levels is important for reasons of occupant health, building structural integrity and building energy use.

Energy conservation initiatives in buildings over the past 30 years have done a lot to reduce sensible (dry bulb) heat loads in buildings. Typical conservation measures undertaken in almost all non residential buildings include: adding higher levels of insulation, utilizing lower energy appliances and lighting, using reflective window films, and introducing higher sensible efficiency cooling equipment.

Temperature Control ≠ Humidity Control

The result is that temperature controlled air conditioning systems are running less and saving lots of energy. However, while the sensible load has been reduced, moisture sources primarily related to people breathing and outside air ventilation that can introduce humid air, have basically remained the same. This has created a problem, where air conditioning is running long enough to control temperature, but in many cases it does not run long enough anymore to remove moisture from the air. This is backed up by a 2003 research study sponsored by ASHRAE where it was determined that if an air conditioner runs for 15 minutes or less, moisture will condense on the coil but will not get to the point where it drains off. When the air conditioner turns off, but air is still blowing through the coil, the moisture evaporates back into the space. This could happen regularly if the system is over sized or if it is operating under part load conditions.

A fundamental rule in our industry has changed: for many humid climate conditions and applications, we no longer believe that controlling for temperature automatically controls moisture. The extreme, but increasingly common proof of this is the proliferation of mold related problems reported in buildings. Higher moisture levels can also impact on comfort and energy efficiency.

Why Dew Point Now?

So why haven't we been regularly measuring dew point in the past? The answer is that until recently, only very expensive, temperamental laboratory grade sensors could measure dew point (i.e. chilled mirror hygrometers). Dew Point can also be derived from a temperature and humidity measurement but requires a complex formula that until recently could only be calculated by using a computer. Working with one of the world leaders in humidity measurement AirTest now offers cost effective dew point sensing solutions to better control building moisture.

Bill Hewlett of Hewlett Packard coined the mantra "You cannot control what you do not measure" when his company started as a breakthrough measurement instrument company. It can no longer be ignored in today's buildings if you want to control moisture you have to measure it. There are plenty of control strategies and equipment that can remove moisture from the air, but accurate measurement of the dew point levels is the only effective way to control the amount of moisture in the air. For further background on the dew point and buildings we would direct you to the reference section at the end of this document. It is also worthy of note, that the increase in global temperatures will also contribute to increased moisture in the air in many geographic areas.

The rest of this document explains three moisture measurement solutions that can be used to better control moisture in all types of buildings. A brief explanation of the product and its application are provided along with links to datasheets and other application resources.

EE10-4 Wall Mount Dew Point & Temperature Transmitter

Description: The EE10-4 is a stable and highly accurate wall mount dew point and temperature sensor that is designed to indicate indoor dew point levels. The signal output is 4-20 mA. EE10-4 datasheet

Guidelines: Indoor dew point conditions should never exceed the design conditions for the space. The chart below shows a variety of design conditions and the corresponding dew point maximum level.

Maximum °F Dew Point For Various Indoor Design Conditions

Indoor Design Temp	Indoor Design Humidity					
	60% RH	55% RH	50% RH	45% RH	40% RH	30% RH
74°F	59.2	56.8	54.2	51.3	48.2	40.6
72°F	57.4	55.0	52.3	49.5	46.4	38.9
70°F	55.5	53.1	50.5	47.7	44.6	37.2
68°F	53.6	51.2	48.7	45.9	42.8	35.5

Applications: Chilled beam/radiant cooling, swimming pools, supermarkets, data centers, dehumidification control, and control of buildings in humid climates

EE46 – Condensation Monitor

Description: The EE46 is a device that measures the humidity occurring on a surface and activates a relay alert when condensation on a cool surface is about to occur. This unit can be mounted to piping, structures, glass and other surfaces vulnerable to condensation. The concept of this device was originally implemented as a window defrost/fogging sensor on the E class Mercedes. EE46 datasheet

Guidelines: This device can be used to quickly notify operators or control systems that liquid condensation is about to occur on cold surfaces. The sensor activates when it sees 95% Td on the surface it is attached to. This can prevent water safety hazards, wetting and staining of building materials and avoidance of conditions that may stimulate mold growth.

Application: Chilled beam/radiant cooling, swimming pools, supermarkets, dehumidification control, control of buildings in humid climates, cold climate dehumidification control.

Fresh Air Economizer Control With Dew Point And Temperature

Description: Fresh air economizers can save a building operator a significant amount of energy by using outside air for free cooling. The problem is that a traditional temperature or enthalpy control strategy can actually allow fresh air to enter the building even though it exceeds the design dew point for the space (see chart above). Airtest has looked at climate data for over 200 cities in North America and found that approximately 1/3 of the time an economizer runs it is bringing in outside air over the indoor design dew point (more if the sensor is inaccurate). This means air conditioning must operate longer and use more energy to dehumidify this unwanted moisture, or comfort and moisture related problems may occur.

Also, during the time that an economizer is operating inefficiently, the energy savings and moisture control that can be provided by CO_2 demand controlled ventilation is lost.

Guidelines: Two conditions must be met for the fresh air economizer to be activated using this approach. 1) Outside temperature must be suitable for free cooling and, 2) the outside dew point must be below indoor design conditions (see chart above). Unlike traditional economizer approaches that require sensors placed in each air handler, one weather station quality outside air temperature and dew point device can be used to control all economizers on a building or within a building complex. For example the City of Pasadena uses one dew point sensor to control the economizers on all city properties within a four block area. There is no need for inside/outside differential measurements using this approach.

Application: Economizer control for any building that has an appropriate climate to use outside air for free cooling.

Further Reference From AirTest

1) It's The Dew Point Stupid!
2) AirTest Dew Point Economizer Design Guide
3) Stop Over Ventilation With CO2 Control
4) Please call us to discuss your application … 604 517-3888 or info@airtest.com