Digital Humidity Sensor

Humidity in a thermal process interacts with the product. The moisture in the environment often comes from the product itself and represents a delicate balance affecting finished product quality in many ways. For example:

- The amount of moisture left in a product can determine its shelf life.
- Reduced evaporation can keep the surface of a product moist, allowing it to stretch, preventing cracks.
- Low humidity in a cracker oven can cause blisters leading to undesirable dark spots and excessive breakage.
- The lack of humidity in a cookie oven can cause case hardening preventing internal moisture from escaping leading to checking (the spontaneous cracking of the cookie after baking).
- High humidity in bread ovens produces the desirable glossy crust seen on many bread products. For this reason steam injection is often used.
- High humidity will assist with the killing of pathogens, like salmonella, potentially found in surface toppings.

Product throughput lb/hr (kg/hr) can also be affected by when and how much moisture builds in a process. Moisture laden environments reduce baking efficiency, thereby reducing product throughput.

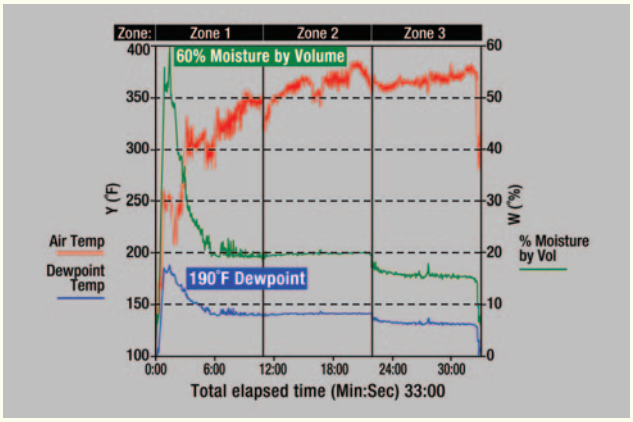
The Process

The SCORPION® 2 Digital Humidity Sensor is designed to measure the moisture content, of the thermal environment, in both heating and cooling processes. It is applicable to proofers, ovens, dryers and cooling tunnels.

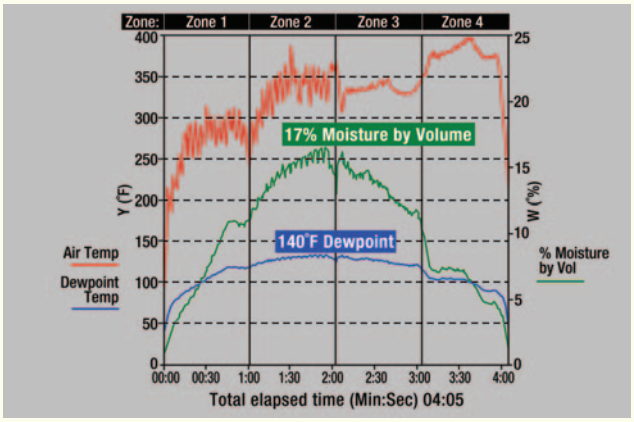
Mechanically the Digital Humidity Sensor is comprised of an Air Temperature sensor, two inputs for Product Core Temperature Measurement and a proprietary humidity sampling system to measure Dew Point Temperature, Absolute Humidity and Relative Humidity. The sampling system contains patent pending Anti-Saturation Technology™ allowing measurements in very high dew point environments such as steam injection.

The Digital Humidity Sensor is engineered to be compatible with direct gas fired (DGF) ovens. Unlike oxygen sensor technology, which can be off by as much as 25% due to combustion gases in DGF ovens, the accuracy of the digital humidity sensor remains the same regardless of the oven platform.

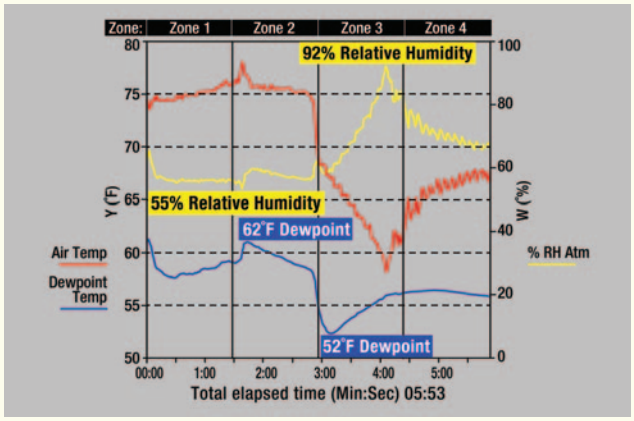
The Humidity Sensor travels through the process with the product, yielding a precise profile of moisture experienced by the product.



Bread Oven with Steam Injection



Cookie Oven



Cookie Cooling Tunnel

Analyzing the Results

In high temperature applications above 212°F (100°C), absolute humidity is displayed. The user can choose between % Moisture by Volume or Humidity Mass Ratio (lb water/lb dry air or kg water/kg dry air).

In low temperature applications below 212°F (100°C), % Relative Humidity is displayed.

In both high and low temperature applications, the dew point temperature and dry bulb air temperature is displayed.

Humidity in ***ovens*** is generally controlled by extraction fans and dampers. Here the sensor is used to display the shape of the humidity profile as well as the peak moisture value obtained and where. In ***proofers*** it is used to document the temperature and relative humidity of the proof cycle. In ***cooling tunnels*** it is used to monitor dew point temperature, preventing condensation on the product surface which causes blooming.

Technical Summary*:

- Number of sensor elements: 2
- Product Probe Inputs: 2
- Data available for display
  - Air temperature (°F or °C)
  - Dew point temperature (°F or °C)
  - % Moisture by volume
  - Humidity mass ratio (lb water/lb dry air or kg water/kg dry air)
  - % Relative humidity atmosphere
- Sensor type: Digital Capacitive humidity chip and Type T thermocouples
- Operating Temperature Range: 32°F (0°C) to 662°F (350°C)
- Accuracy: ±5% of full scale for Humidity and Dew Point
- Response Time: t60 = 3sec in air at 200 ft/min (1m/sec)
- Dew Point range: 32°F (0°C) to 212°F (100°C)
- Relative Humidity Range: 0 to 100% RH Atm
- Absolute Humidity range: 0 to 100% Moisture by volume
- Dwell Time: See Digital Humidity Sensor Dwell Time Graph
- Battery running time: 4+ hrs.

**Not rated for condensing environments*

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