Humidity Sensor

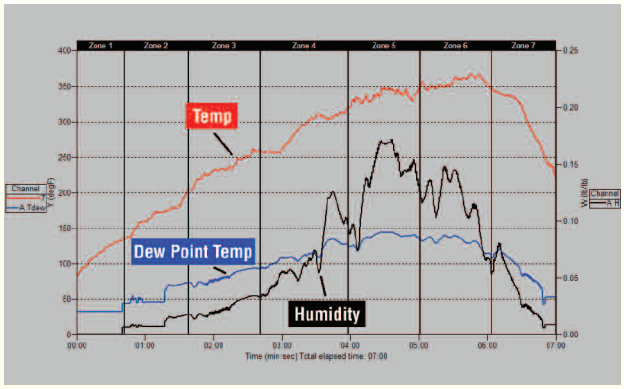
Product passing through a thermal process interacts with the amount of moisture present in the environment. This moisture often comes from the product itself and represents a delicate balance affecting finished product quality in many ways. For example:

- The amount of moisture left in a pretzel can determine its shelf life.
- Reduced evaporation can keep the surface of a cookie moist, allowing it to stretch, preventing cracks.
- Some products require surface condensation to produce a concentrated sugar solution, which gives the surface a glaze.
- Finished product moisture can directly affect breakage during the packaging process.

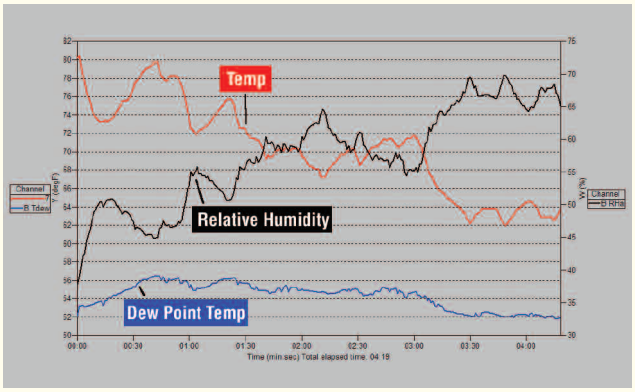
Product throughput kg/hr (lb/hr) can also be affected by when and how much moisture builds in a process. Moisture laden environments reduce baking efficiency, thereby reducing product throughput.

The Process

The SCORPION® 2 Humidity Sensor is designed to measure the absolute moisture content, of the thermal environment, in both heating and cooling processes. Mechanically the Humidity Sensor is comprised of a high temperature moisture sensor, a low temperature moisture sensor, and a bulk air or dry bulb temperature sensor. The moisture sensors are located inside small-insulated chambers, which receive samples of the environment's air via an axial fan drawing air through precision openings on the front of the device. Both sensor elements are analog capacitive devices, which produce a voltage output linearly related to the moisture content of the sampled air. The High Temperature Sensor "A" is mounted on a solid-state heating system to resist condensation in high humidity environments. The Low Temperature Sensor "B" is maintained at room temperature via a heat sink and surrounding insulation. The Humidity Sensor travels through the process with the product, yielding a precise profile of moisture experienced by the product.



Oven



Cooling Tunnel

Analyzing the Results

In high temperature applications above 100°C (212°F), the output from Sensor A is used and displayed as humidity mass ratio in kg water/kg dry air (lb water/lb dry air). In low temperature applications below 100°C (212°F), the output from Sensor B is used and displayed as % relative humidity. In both high and low temperature applications, the dew point temperature and dry bulb air temperature can be displayed. **In Ovens**, the Humidity Sensor can be used to document the relationship between oven moisture and finished product moisture. **In Cooling Tunnels** it can be used to monitor dew point temperature, preventing condensation on the product surface.

Technical Summary:

- Number of sensor elements: 3
- Number of channels displayed: 6
  - Bulk air or dry bulb temperature
  - Dew point temperature (A & B)
  - Humidity mass ratio (A & B)
  - % Relative humidity atmosphere (B only)
- Sensor type: Capacitive humidity chips and type T thermocouples
- Operating Temperature Range: 0°C (32°F) to 350°C (662°F)
- Accuracy: ±5% of full scale
- Response Time: t60 = 3sec in air at 1m/sec (200 ft/min)
- Dew point temperature:
  - Channel A 30°C (85°F) to 85°C (185°F)
  - Channel B 0°C (32°F) to 40°C (104°F)
- Battery running time: 4+ hrs.

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7 Corporate Boulevard • Sinking Spring, PA 19608 USA • Ph: 610-678-5890 • Fax: 610-693-6262 • E-mail: info@readingthermal.com • www.readingthermal.com