Practical Aspects of Measuring Humidity in Commercial Buildings

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Key Issues
(For Commercial Installations)

- The sensor’s operating principle and it’s “Factory Accuracy” are usually less important than:
- Site-dependent variables
  - Economic & health consequences of accurate measurement
  - Location which most needs controlled humidity
  - Cycling range, speed and frequency (Sensor placement)
  - Contaminant load
  - Frequency of calibration
- Sensor characteristics
  - Installed and field-calibrated cost
  - Cost and ease of recalibration (in-place)
  - Repeatability
  - Response time
Health & Economic Consequences

- Most humidity-related health consequences are caused by condensation, and require long-term exposure to at-risk population: Hospitals & Nursing Homes
- “Soft” economic consequences = No-choice occupancies: Schools, Office Buildings
- “Less-soft” consequences = Patron-choice occupancies: Restaurants, Retail Clothing
- “Hard” economic consequences = Energy cost for humidity control
  - Museums
  - Hospitals
  - Supermarkets
  - Ice arenas
The Location That Needs Control

- Copier room vs. patient rooms
  - High temperature means low rh – copier room does not reflect the rh in patients’ rooms

- Ice arena wall vs. ice surface
  - Ice needs constant dew point, wall rh varies widely with temperature

- Supply air duct vs. inside the museum
  - Artifacts need constant rh, but local heat loads cause rh fluctuations
Cycling Range, Speed & Frequency

- Incoming outdoor air vs. return air
  - Outdoors – 10 to 100% rh, frequent condensation
  - Return air – 20 to 60% rh, no condensation

- Inside wall vs. near the door
  - Internal wall temp more stable
  - Door openings lead to fast changes

- Near humidifier or dehumidifier
  - Fast changes, wide range as components turn on and off
Contaminant Load

- Outdoor air vs. indoor air
  - Outdoor air carries much particulate and gaseous contamination

- Upstream vs. downstream of filters

- Near pollutant source
  - Kitchen wall pass-through
  - Above heated therapy pool
Frequency of Calibration

- Does the sensor report the correct humidity?
  - Now vs. at the factory
  - Now vs. six years ago after installation

- Can it actually be calibrated at all?
  - Does the sensor allow adjustment?
  - Can the sensor be reached by a technician?
  - The reality of people
    - Anybody assigned to it?
    - Do they know they are assigned?
    - Do they know how to calibrate?
    - Do they actually do it? How often?
Summary: Tough vs. Easy Measurements

- **Tough (Expensive to do accurately)**
  - Outdoor air
  - RH above 80% or below 20%
  - Supply air RH
  - More accurate than ± 2% RH

- **Easier (Less expensive to do accurately)**
  - Indoor air away from heat sources
  - RH between 40 and 60%
  - Return air
  - ± 5% RH or wider (between 40 and 60%)

- **Out of the Question**
  - Accurate measurement without a calibrated sensor
  - Accurate measurement without regular recalibration