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How to protect data centers

Moore Industries shows how best practices and its HTZ transmitter can keep temperature and humidity within optimal ranges

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"Given their need for continuous, 24/7 operations, and the risks posed by even minor deviations, environmental monitoring in data centers must be accurate, scalable, reliable and easily deployed."

WHILE power and cybersecurity often take center stage in today's 24/7 data centers, environmental factors like temperature and humidity are equally crucial. Improper climates can cause hardware failures, decreased equipment life and inefficient energy use. Consequently, environmental monitoring is foundational to managing data centers.

For instance, overheating is a silent threat because servers and hardware generate heat. If not properly cooled, internal temperatures can exceed safe thresholds, causing hardware to malfunction or shut down. Similarly, too much or too little humidity can each be hazardous. High humidity can produce condensation that risks short circuits and corrosion, while low humidity increases the potential for electrostatic discharges (ESD) that can also damage electronics. Meanwhile, energy efficiency is necessary because overcooling data centers to avoid overheating can drive up energy consumption and costs.

Likewise, these hazards or combinations of them are the reason that service-level agreements (SLA) and industry standards depend on documented, verifiable environmental controls. To maintain safe operating environments in data centers, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) recommends basic environmental ranges of 18 °C to 27 °C (64 °F to 80 °F) and 40% to 60% RH. Preserving these ranges minimizes risks of equipment failures, and supports more efficient energy use.

Best sensing and systems practices

However, just as optimal humidity and temperatures rely on accurate monitoring, it depends on proper sensor deployment, using appropriate monitoring systems, and coordinating with data center infrastructure management (DCIM) platforms.

Depending on the monitoring required, ideal sensor locations include:
- Rack inlets and outlets for capturing air intake/exhaust conditions,
- Cold and hot aisles that ensure effective airflow distribution,
- Underfloor air plenums for monitoring cooling delivery effectiveness,
- Ceiling ducts that can track return air trends, and

TEMPERATURE AND HUMIDITY MONITORING TRANSMITTER

To accurately and repeatably measure humidity and temperature in data centers, Moore Industries provides its HTZ smart HART, compact, loop-powered humidity and temperature transmitter. Originally engineered to meet the precision and reliability demands of semiconductor fabrication rooms, HTZ's easy programming and installation makes it ideal for data centers where uptime is critical. HTZ's primary features and benefits include:
- High accuracy of ±2% relative humidity (RH) and ±0.3 °C ensures reliable data for decision-making
- 4-20 mA HART output enables simple integration with PLCs, SCADA systems or building management systems (BMS)
- Long-term stability that minimize calibration schedules
- Rugged, compact housing that fits into tight spaces, and withstands industrial environments
- HART protocol support that eases configuration and maintenance
- Combined temperature and RH functions that reduce installation complexity and cost
- Industrial-grade measurement capabilities that are designed and built to last, and are superior to building-management sensors

- Uninterruptible power supply (UPS) locations and battery rooms, where users can monitor humidity-driven condensation risks.

In addition, the three main types of environmental monitoring systems include: spot monitoring with fixed sensors to provide point-specific data; zone monitoring that examines environmental conditions across designated areas; and mobile monitoring with portable sensors or devices used for temporary diagnostics.

After appropriate sensors and system types are selected, environmental monitoring solutions must also integrate with existing or applicable DCIMs, which also rely on real-time sensor data to optimize their environmental controls and energy efficiency. Their sensors should likewise provide industry-standard outputs and open communication protocols compatible with most SCADA, PLC or other control systems, such as 4-20 mA, HART or Modbus. Once sensors, system types and DCIM integration are in place, real-time environmental monitoring can succeed.

Data center scenarios

To show how environmental-monitoring sensors, systems and principles are implemented, consider a large-scale data center with high-density servers operating 24/7. Its environmental control strategy includes correctly balancing temperature and humidity to protect the servers and minimize risks of overheating, ESDs or condensation.

The data center has approximately 150 measurement points. Sensor placement in these critical areas enables environmental visibility, and supports rapid anomaly detection. They're located in:

- Cold aisles, where users can monitor cooled intake air delivered to servers;
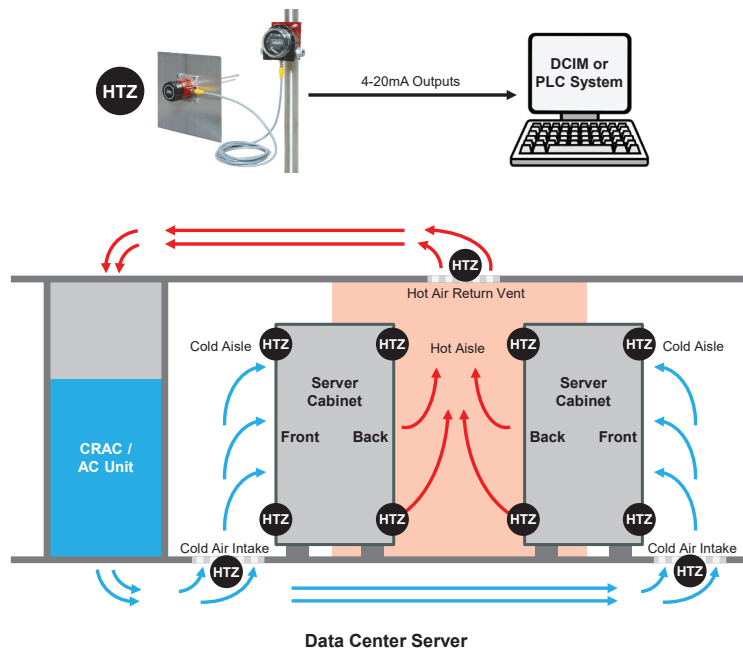- Hot aisles, where measuring exhaust air can verify thermal output;

Figure 1: An application diagram of HTZ placements in a data center's server room shows how it can monitor cooling performed by a computer-room, air-conditioning unit that manages temperature and humidity. Source: Moore Industries-International Inc.

- Above and below server racks to ensure environmental uniformity in sensitive equipment zones; and
- HVAC ducts to validate performance of air handling systems (Figure 1).

More specifically, in high-availability data centers, precise environmental control is nonnegotiable. Server rooms must maintain relative humidity between 40% and 60% because, if humidity falls below 40%, static electricity can build up, potentially causing ESDs and equipment damage. However, if humidity rises above 60%, condensation can cause corrosion, short circuits or catastrophic failures.

Given the need for continuous, 24/7 operations and the risks posed by even minor deviations, environmental monitoring in data centers must be accurate, scalable, reliable and easily deployed. One solution that meets these needs is Moore Industries' HTZ

humidity and temperature transmitter. It's designed for industrial environments, and provides:

- Accurate and stable RH and temperature measurements,
- 4-20mA analog output with HART communications,
- Compact and rugged construction for versatile installation, and
- Low maintenance costs and long-term reliability.

Thanks to these capabilities, HTZ lets data centers monitor and maintain stable humidity levels within the recommended 40-60% range; reduce risk of ESDs and condensation-related equipment damage; minimize downtime and maintenance issues; ensure 24/7 uptime with high-resolution environmental data for continuous optimization; and support facility-wide redundancy with dense sensor coverage across all airflow zones. ∞