White Paper:

Server Room Environmental Monitoring

Monitoring temperature, humidity and other environmental parameters to ensure maximum reliability while lowering cooling costs and achieving greener IT

BURK
TECHNOLOGY

Introduction

How the Server Room Environment Affects Businesses

Equipment in the server room is responsible for the smooth operation of a business and its revenue stream. The impact of downtime ranges from direct loss of revenue to decreased customer satisfaction and damaged reputation. One of the leading causes of downtime in the server room is heat.

Server rooms require a constant source of cool air to combat the heat generated by densely populated server racks. Even a brief cooling outage can result in rapidly rising temperatures, eventually leading to downtime and even data loss.

Cost Effective Reliability

For years, many businesses have taken a cautious approach to server room cooling by setting temperatures well below dangerous levels. While the maximum recommended temperature is 80.6 °F[1], it is not uncommon for IT departments to cool server rooms to 68 °F or lower.

Unnecessarily low server room temperatures are a burden on IT budgets that businesses can simply no longer bear. As managers look to cut costs in a difficult economy, server room cooling expenses are under more scrutiny than ever.

Further, the global environmental impact of server room cooling and power consumption has become a mainstream concern. As many companies adopt Green IT initiatives, more responsible cooling practices are a necessity.

Server rooms require adequate cooling and ventilation to maintain safe equipment temperatures.

Impact on Businesses of All Sizes

Server room cooling is a concern that businesses of all sizes face. Large companies, such as Facebook, Google, IBM and Hewlett-Packard, are increasingly turning to "free cooling"[2]. These companies are relocating their massive data centers to naturally cool locations in order to use outside air to cool equipment.

For small and medium sized businesses, such drastic changes are not realistic. The problem, however, is just as real. And with smaller IT staffs, responding to a cooling-related problem can be a considerable expense.

More than Just Temperature

Temperature is not the only environmental threat in the server room. Humidity, flood and leaks, fire and physical security require concern as well. Achieving reliability requires IT management to address all of these factors.

With the 24x7 demands placed on IT, a comprehensive environmental monitoring solution is necessary to ensure the kind of reliability that businesses require.
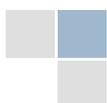
Server Room Environmental Monitoring

Server room environmental monitoring solutions allow IT managers to monitor temperature, humidity and other environmental conditions that threaten the reliability of server room equipment. By monitoring environmental conditions, IT managers can ensure uptime while keeping facilities costs in budget.

Five Reasons to Monitor Server Room Temperature

1. Protect Mission-Critical Equipment from Failure and Data Loss

Heat can cause decreased performance, intermittent failures, total equipment failure and data loss. If a server room air conditioner fails, room temperature can rise rapidly. Often times there may be no sign of a problem before it is too late. IT personnel need to know immediately if the temperature begins to rise.

2. Environmental Threats are heightened After Hours

When an environmental problem occurs after hours, it can easily go undetected until the next business day. During that period, heat and other conditions have more than enough time to wreak havoc on mission-critical systems. IT staff may be on call and ready to handle a problem, but require notification that a situation is unfolding.

3. Rack Temperatures Matter more than Room Temperatures

While measuring ambient temperature in the server room is important, the real concern is the temperature inside the racks. There are many variables that affect how rack temperature differs from room temperature.

The only way to know for sure that equipment is operating in a safe environment is to monitor the temperature inside the rack itself. By measuring the temperature at the locations where it matters most, IT managers can have a more accurate picture of the server room environment.

4. Ensure Air Distribution Doesn't Create Hot Spots

Temperature can vary across each rack in a server room. The amount and type of equipment in each rack, as well as differences in cool air distribution, can cause surprising variation in temperature from one rack to another. Knowing that all equipment is running safely requires monitoring more than just one rack. A properly implemented monitoring solution will direct IT staff to the specific area that requires work.

5. Lower Cooling Expenses without Lowering Reliability

Server room cooling expenses can account for a significant portion of an IT department's operating expenses. In order to cool more efficiently and cost effectively, server rooms must run warmer than ever before. Having less temperature headroom necessitates more temperature monitoring. A monitoring solution assures IT that equipment is operating in tolerable conditions at all time, without relying on the safety net of over cooling.

Why Humidity is Just as Important

Low humidity increases the risk of electrostatic discharge (ESD)[3]. ESD can cause immediate and catastrophic failure of electronic components. Repairing damaged components can be costly, but the larger threat comes from downtime. Routine maintenance in the server room could
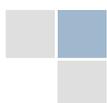
turn into an accidental extended service outage caused by a simple electrostatic shock.

Not all ESD events are noticeable and immediate. Electrostatic shocks can be below the threshold that a person can detect[4], making it impossible to know that an ESD event has occurred at all. Furthermore, the effects can be intermittent and even delayed as damaged electronic components can degrade rather than fail outright. In these cases, performance problems and crashes may appear from time to time, requiring extensive and time consuming troubleshooting.

High humidity poses its own threats as well. Most electronic components are designed to operate within a specific humidity range. Disk drives are also intended to run within a range, and can fail in high humidity environments, causing loss of data and downtime.

Routine maintenance can be the source of an ESD event, causing issues ranging from immediate catastrophic failure to long term intermittent problems.

Activity Monitoring After Hours

Many server rooms are left unattended after hours, and some during the day as well. IT is responsible for not only the physical security of the server room, but the impact on cooling if doors are left open, lights are left on, etc.

Non-technical staff is often unaware of how critical 24x7 cooling is in the server room. Facilities personnel, janitorial staff, or employees working after hours may inadvertently sabotage the server room by leaving a door open or adjusting a thermostat.

Installing motion detectors and door contacts is a simple and affordable way for IT staff to keep aware of activity in the server room. A monitoring system can alert responsible personnel if doors are left open, or a room is accessed after hours.

Four Problems that Can be Identified by Monitoring Sound Levels

1. Increased Fan Speed
Servers and other equipment often use variable speed fans that will run at higher speeds as conditions become adverse. An increase in background noise level may indicate that one or more fans are running fast. This could be due to a cooling or ventilation problem, or other equipment issue.

2. Loss of One or More Fans
A drop in background noise may mean that one or more fans have stopped running entirely. Monitoring audio levels allows IT personnel to detect a cooling problem as early as possible.

3. Activity in the Server Room
In addition to door contacts and motion sensors, audio levels are a useful way to watch for activity in the server room. This helps build a more complete picture of what kind of activity has taken place.

4. Abnormal Events Outside of the Server Room
Conditions that affect the server room don't always happen inside the server room.
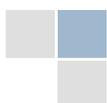
Background noises may be due to abnormal activity in other rooms (such as maintenance or renovation work), as well as outside the building (such as thunder). This information helps IT correlate external events with changes in the server room. For example, noise from a renovation project in the next room might correspond with a telecom outage, helping IT determine the source of the problem.

Flood and Leak Detection

Server rooms can suffer water damage from many sources. Burst pipes or a faulty fire sprinkler system can cause rapid, devastating damage. A roof leak might wait until a rainstorm to reveal its destructive potential. Even air conditioners and other server room cooling solutions can leak water, creating hazardous pools.

Well placed flood/leak detectors connected to an environmental monitoring system will ensure IT staff is alerted immediately in the event of a water-related problem.

Smoke and Fire Detection

Additional smoke detectors in the server room will ensure IT has as much notice as possible in the event of a fire. This allows responsible personnel to begin implementing disaster recovery procedures as early as possible, minimizing overall downtime.

Using a Log to Identify Problems

Many environmental problems in the server room are intermittent in nature. These can be among the most difficult to troubleshoot, especially when working with HVAC contractors and other outside personnel.

Having a log of environmental data in the server room allows IT to prove the existence of an intermittent problem. Further, the nature of the

data may lead technicians to the root cause faster and more efficiently.

And because server rooms are not often attended 24x7, a log is the only way for IT management to know for sure what is happening on a daily basis.
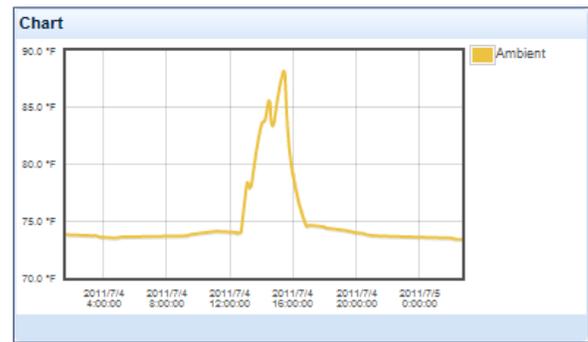
This chart shows a brief spike in ambient temperature caused by an intermittent AC failure in a small server room.

Climate Guard

Burk Technology leveraged over 25 years of critical systems monitoring to develop Climate Guard. Climate Guard is a server room environmental monitor idea for small to medium sized businesses.

Climate Guard, a rack mount server room environmental monitor from Burk Technology.

Unique Approach

Burk's approach to environmental monitoring ensures maximum uptime and reliability, while helping to minimize the impact that cooling and monitoring have on IT budgets.

100% Web-based

IT managers are overloaded with monitoring and utility applications. Climate Guard uses an embedded web server to provide full-featured

functionality without requiring any client or server software.

Climate Guard's built-in web user interface shows live as well as logged data from environmental sensors.

Onboard Logging

Climate Guard automatically logs sensor data without requiring external database integration. The system displays onboard logs via its web UI. Climate Guard reports data both as a chart and as a downloadable text log.

Accurate Alerts

Prompt, accurate alerts are critical for an environmental monitoring solution. Climate Guard supports email, SMS and SNMP alerts, ensuring appropriate IT staff are immediately notified of a problem condition.

Scheduling, adjustable limits, delays and hysteresis make Climate Guard's alerts accurate and dependable by eliminating false alarms. IT staff can trust that alerts are legitimate, and be confident about taking action.

Visual Activity Log

Physical activity detected via motion sensors and door contacts is displayed visually through Climate Guard's web UI. This unique display allows faster interpretation of data than simply reviewing text logs.
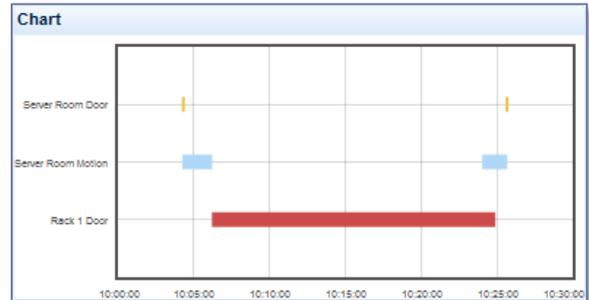
This chart shows activity on the server room door, rack door and a motion sensor in the room.

Learn More

To learn more about Climate Guard, and to try the live, web-based demo, visit **http://climateguard.burk.com**.

For more information about Climate Guard, email sales@burk.com, or call 978-486-0086.

About Burk

Burk Technology designs, builds and sells high-quality electronics that monitor and control mission-critical facilities and functions. Industry professionals trust Burk Technology for unmatched reliability and smart engineering. Winner of numerous industry awards for excellence and innovation, Burk Technology has been serving the business, government and education sectors worldwide for 25 years.
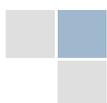
References

[1] American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (2008). "2008 ASHRAE Environmental Guidelines for Datacom Equipment".
http://tc99.ashraetcs.org/documents/ASHRAE_Extended_Environmental_Envelope_Final_Aug_1_2008.pdf

[2] Wired. (2011). "2011: The Year Data Centers Turned Green."
http://www.wired.com/wiredenterprise/2011/12/green-data-centers-of-2011/

[3] Electrostatic Discharge Association. (1999). "ESD Association Standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)".
http://snebulos.mit.edu/projects/reference/NASA-Generic/ANSI-ESD-S20-20.pdf

[4] PCWord. (2002). "Avoid Static Damage to Your PC".
http://www.pcworld.com/article/82184/avoid_static_damage_to_your_pc.html