Optimal Energy Management with Intelligent, Wireless Control

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Federspiel Controls
Enterprise Energy Management Systems

Overview

• What we do
• Why wireless
• Case study
What we do:
Enterprise Energy Management

- Data centers
  - 1.5% of US energy spend (2006)
  - Growing at 15% per year
  - Cooling is 50% of it

- Large Buildings
  - Pneumatic control
  - Too inefficient to build legally,
  - Too expensive to fix conventionally

A Comprehensive Approach

- Sophisticated tools that allow operators to Measure, Model, and Manage complex environments
- Standards-based, IT-centric design
- Non-disruptive overlay to facilities and IT
- Service business model - EMaaS
System Architecture

Why Wireless

- Non-disruptive
  - Pulling cables in a data center is risky
- Flexible
  - Racks come and go in data centers
- Fast
  - Time is money
Wireless Requirements

• Long battery life
  • More than 2X the simple payback
• As reliable as wire
  • Wired networks aren’t perfect
• Secure
  • Data centers are as secure as Fort Knox

Case Study: CA Franchise Tax Board

• 10,000 sf data center
  • 12 cooling units
  • 4X over-provisioned
• Results
  • Fan energy reduced 60%
  • Total energy reduced 15%
  • $30,564 per year in savings
• Payback in under 2 years
Wireless Sensors

Wireless Battery Performance

Cumulative Percentile

Battery Life, Months

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

25 30 35 40 45 50 55 60 65
Wireless Network Performance

lost packets per module out of 222,920 packets per module (154 days)

number of modules

0 1 2 3 4 5 6 7 8 9 10

0 1 2 3 4 5 6 7 8 9

Thermal Mapping

One dimension of the problem
Simple Analytics

36% of rack-tops exceed standard of 77°F

Intelligent Energy Management

- Predictive data model
  - Multi-variate
  - Interactions drive AI decision-making and analytics
- Adaptive and dynamic
  - Self-configuring
  - Self-maintaining
- Self-optimizing
  - Optimize temperature distribution
  - Minimize energy consumption
A Model that learns & evolves

Learns the impact of changes

CRAH 3 influence at commissioning  
CRAH 3 influence after curtains

CRAH 1  
CRAH 3

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Thermal Risk Management

Temperature change rate

Average temperature, degF

100 degF risk line

higher risk

lower risk
Energy Management Results

Summary

• Improved IT reliability
• Improved resilience, redundancy
• Improved capacity management
• Extended equipment life
• Reduced maintenance costs
• Reduced staffing costs
• Reduced energy costs
Optimizing Performance

![Graph showing Energy Savings Opportunities and Resilience Opportunities]

- **Energy Savings Opportunities**
- **Resilience Opportunities**