Environmental Management

LTE-Enabled

The increasing cost of energy is forcing service providers to better understand which site equipment is consuming how much energy and determine methods for reducing energy consumption. Because site equipment is utilized 24 hours per day, making it more efficient can save a company thousands or millions of dollars each year on energy costs while also protecting the environment.

Maintaining critical infrastructure at remote sites requires strict control over environmental site conditions. For example, a failed Heating, Ventilation, and Air Conditioning (HVAC) system due to high temperatures can cause critical issues for a remote site, especially during harsh weather conditions. When environmental conditions are outside of a predefined threshold, technicians must be notified quickly to initiate proactive maintenance and minimize or prevent damage to systems and site availability.

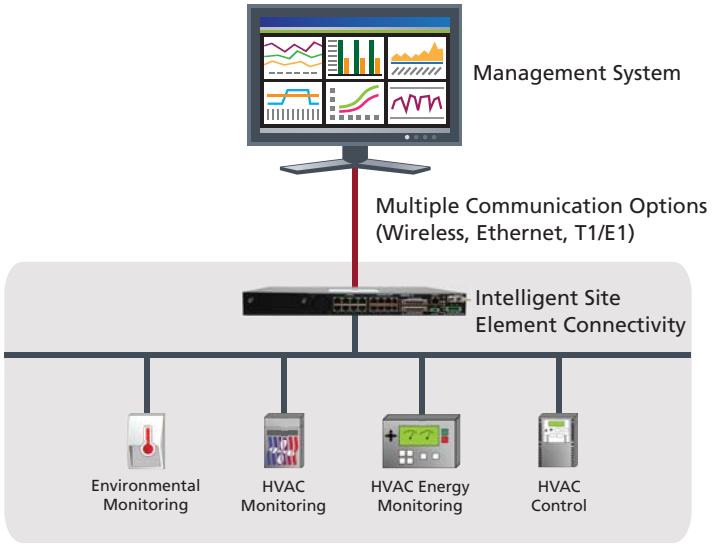
The Kentrox environmental management solution provides the applications required to help service providers monitor and control remote site conditions to ensure normal operation, provide notification of poor conditions, and enable remote management to reduce costly site visits. Required repairs or adjustments can be accomplished before service is affected. The applications use the Optima management system and Remote suite of products to provide the following:

- Environmental monitoring
- HVAC monitoring
- HVAC energy monitoring
- HVAC control

Some of the many benefits the Kentrox environmental management solution provides include the following:

- Allows proactive management of a site's physical environment
- Enables optimization of site energy consumption
- Provides performance and trending data to positively impact equipment purchasing decisions
- Conforms to EPA and other regulatory body air quality regulations by providing compliance reports

Kentrox Environmental Management Solution

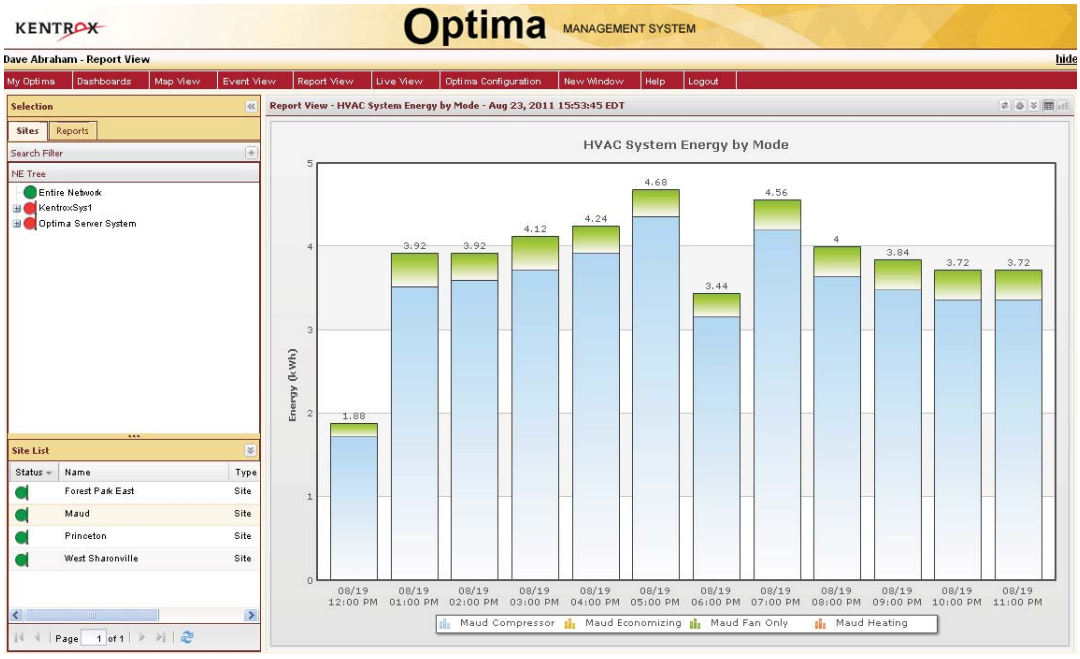


Environmental Management

Environmental management applications

Environmental monitoring

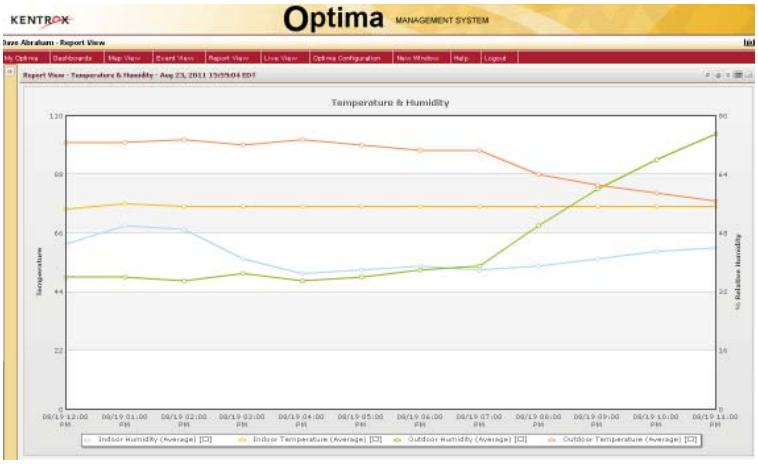
Managing the environmental conditions at a site is critical to help reduce site visits and identify issues before they occur. The Kentrox environmental monitoring application monitors the indoor temperature and humidity of a shelter, equipment cabinet (Kentrox or non-Kentrox), or other location and the outside ambient air temperature and humidity. The application also monitors if a door is open or if smoke is detected inside the cabinet, shelter, etc. If any predefined thresholds are crossed, an alarm is initiated to notify the relevant personnel of potential issues. Reports are available to see performance and trending over time for temperature and humidity readings and site access.



HVAC energy report displaying amount of energy used per day per mode (compressor, economizing, fan only, and heating).

Alarms:
Temperature threshold crossings
Humidity threshold crossings
Door open
Smoke detection

Reports:
Temperature and humidity (line)
  Indoor/outdoor temperature (average, maximum, minimum)
  Indoor/outdoor humidity (average, maximum, minimum)
Site access (bar)
  Door open count
  Door open duration



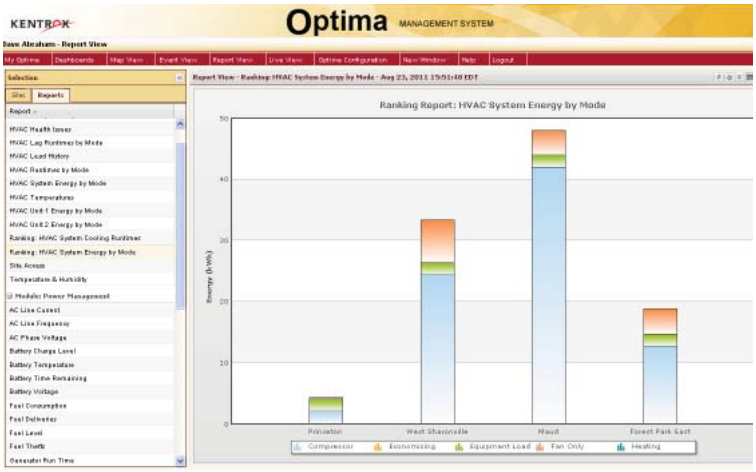
Environmental monitoring report displaying the average indoor and outdoor temperature and humidity.

HVAC monitoring

Monitoring the conditions of the HVAC is important to ensure the equipment is running effectively and efficiently. The HVAC monitoring application from Kentrox provides alarms and reports to provide an understanding of the equipment status. The informational alarms provide details such as what mode each HVAC(s) is currently running in (cooling, heating, economizing, fan only). HVAC monitoring reports provide details such as HVAC runtime for each mode, power failures, controller communication errors, and HVAC(s) temperature.

Alarms:
Cooling HVAC system
Heating HVAC system
Economizing HVAC system
Fan only HVAC system
HVAC 1 and 2 lead and cooling
HVAC 1 and 2 lead and economizing
HVAC 1 and 2 lag and cooling
HVAC 1 and 2 lag and economizing

Reports:
HVAC temperatures
  Indoor/outdoor (average, maximum, minimum)
  HVAC 1 and 2 intake/outlet (average, maximum, minimum)
HVAC lead history
  HVAC 1 and 2 lead time
HVAC runtimes by mode
  HVAC 1 and 2 compressor, economizing, fan only, heating



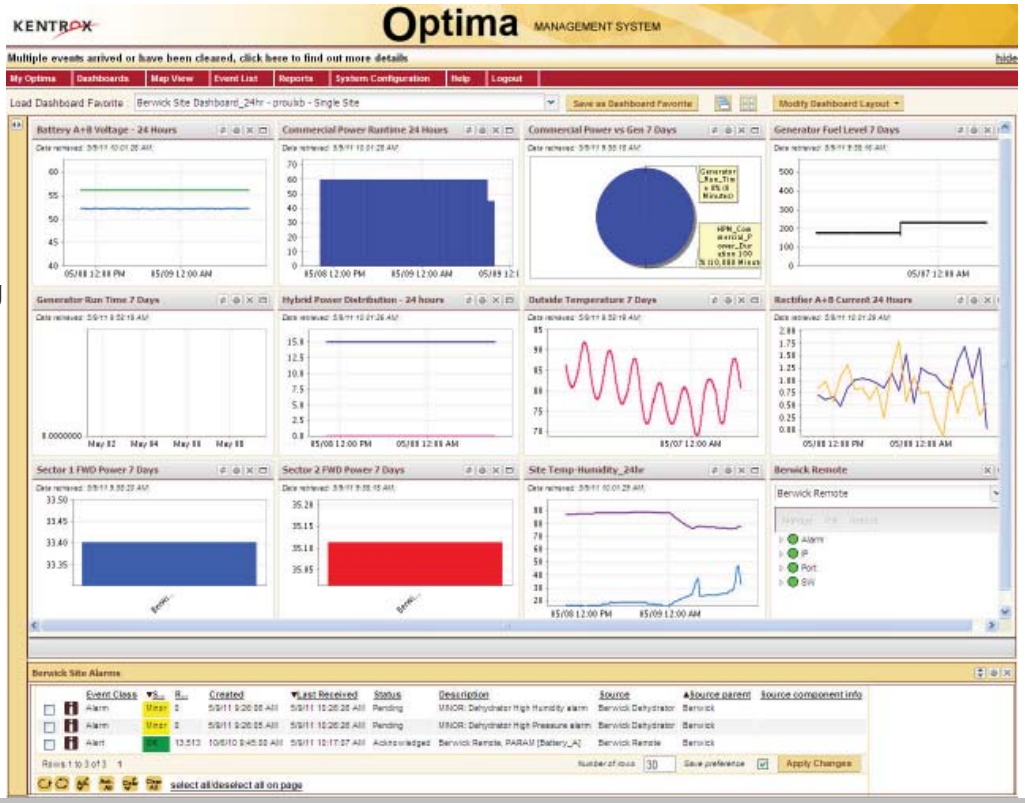
HVAC system energy ranking report displaying the energy used at multiple sites by each mode (compressor, economizing, equipment load, fan only, and heating).

HVAC compressor cycles
HVAC lead and lag runtimes by mode
  HVAC 1 and 2 compressor, economizing
HVAC health issues
  HVAC 1 and 2 power failures
  Communication error
  Settings mismatch
  System lockout
Ranking: HVAC system cooling runtimes by mode

HVAC energy monitoring

Reducing the amount of energy consumed at a site is important to service providers. Because an HVAC often uses up to 48% of total energy consumed at a site (although it can be higher), optimizing energy consumption will reduce operating costs. The Kentrox HVAC energy monitoring application monitors real-time energy consumption of HVAC systems to verify efficiency of the cooling systems. The reports provide valuable data for decision making of HVAC set points and future equipment purchases to obtain maximum efficiency.

Reports:
HVAC system energy by mode
HVAC 1 and 2 energy by mode
Ranking: HVAC system energy by mode



Optima dashboard displaying conditions of a site for a 24 hour period and site alarms.

HVAC control

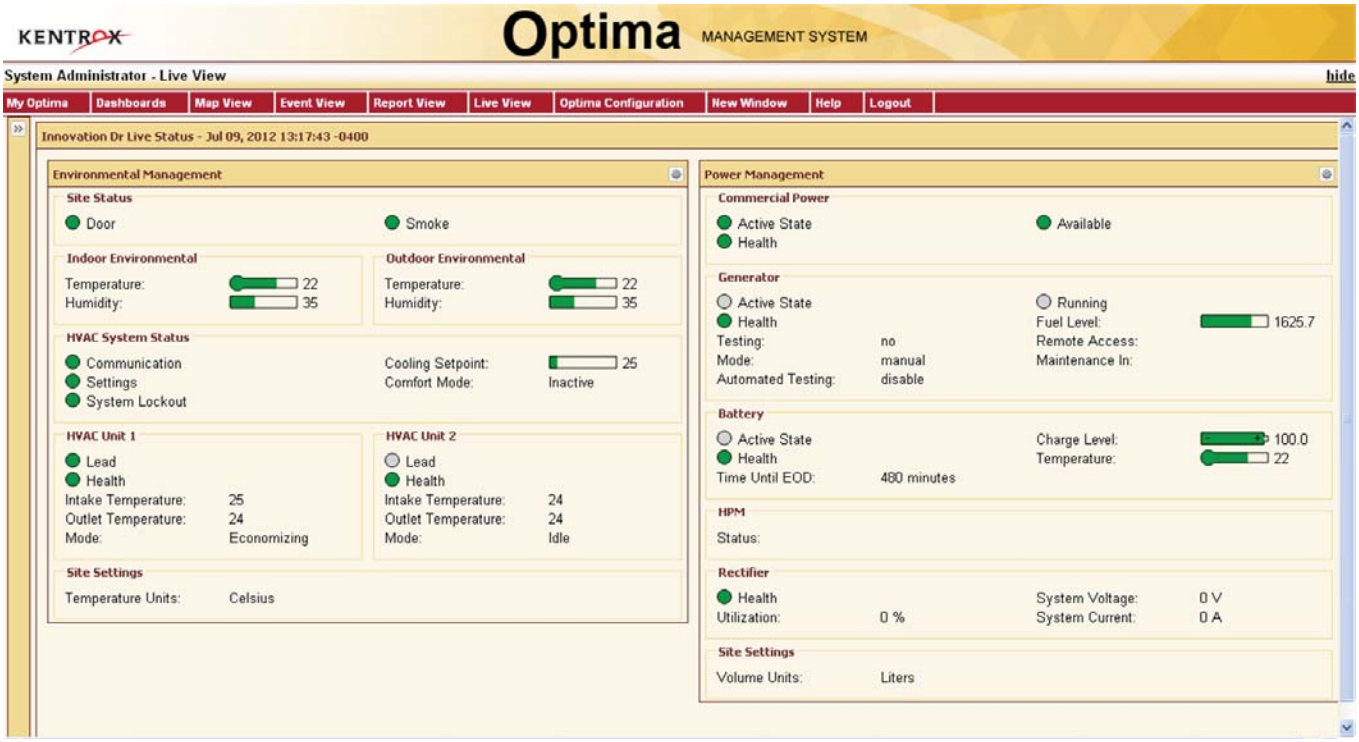
Controlling the HVAC remotely reduces truck rolls and improves diagnostics. The HVAC control application from Kentrox centralizes control of HVAC conditions such as enabling the service provider to remotely switch which HVAC is the lead unit, clear active lockouts from the HVAC system, and force a configuration synchronization with the HVAC. The cooling set points and number of days to wait between a lead/lag swap can also be remotely controlled.

Alarms:
All actions and controls

Interactive applications

The applications in the environmental management solution work together, providing intelligent information to the service provider to help reduce energy costs. For example, the information obtained from the HVAC monitoring and energy reports can provide a comprehensive understanding of when each mode is being used and for how long. This can result in the HVAC control application being used to remotely change a set point. The HVAC monitoring and energy monitoring reports also help minimize energy consumption. For example, if the outside air is cooler than the air inside a cabinet or shelter and the outside humidity is low, the HVAC system can utilize the economizer mode to circulate outside air into the facility instead of running the compressor. This quickly reduces energy-related costs and extends the service life of the HVAC system.

Environmental Management



Live View report for environmental management (left) showing status of HVAC systems and environmental conditions (power management status is shown in the right side of the screenshot).

The products

The Optima management system provides complete visibility and control of network infrastructure sites, such as cell sites and remote communication shelters. It allows immediate operational cost reduction to organizations that need to access, monitor, and manage large numbers of sites. Optima delivers these site benefits by remote monitoring, control, and automation over the maintenance and management of infrastructure and physical elements.

The Remote suite of products includes monitoring and control site devices that provide IP management to remote locations and equipment. The products provide site alarm monitoring, protocol conversion, and equipment connectivity and acts as an intelligent extension of your Operations Support Systems (OSS). It is designed to enhance your network management strategy, reduce operational costs, and improve operational efficiency with reduced truck rolls.

Remote RMX-3200

Remote RMM-1400

Kentrox for environmental management

The environmental management solution from Kentrox allows service providers to be proactive in managing a site's physical environment. Valuable information is provided to positively impact equipment purchasing decisions for new and existing deployments by identifying sites where HVACs are underperforming or where systems can be replaced for better efficiency. The reports also provide the details needed to conform to federal, national, or local air quality compliance reporting.

Energy consumption can be optimized while also helping protect the environment. Environmental management ensures systems run efficiently and are properly maintained. Additionally, it optimizes HVAC settings and automates the control logic and function for constant energy savings. The remote management capabilities reduce site visits and enable intelligent dispatches to fix issues faster when they do occur.

The environmental management solution includes the information, reports, measurements, network elements, alarms, and sensors/controllers that are needed for each application. This functionality provides a simplified configuration and setup to minimize the time required for implementation.

For more information, visit www.kentrox.com, email info@kentrox.com, or call 800-733-5511 (US), +1 614-798-2000 (outside US).

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