Taking a Stand Against Mother Nature

GlaxoSmithKline protects research facility with Rockwell Automation Power & Energy Management Solution

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Electrical power systems are dynamic and fragile — precariously balanced between supply and demand and often interrupted by Mother Nature. Through any number of external and internal factors — from lightning strikes and ice storms to burnouts and overloads — a power system can be thrown off balance, leaving facilities in the dark and its assets vulnerable. And Mother Nature is, if anything, unpredictable and uncontrollable — two variables that strike fear in facility engineers.

Regularly hit by Mother Nature's wrath, Eastern Pennsylvania is particularly vulnerable to power system instability. Frequent spring thunderstorms and lightening strikes and summer temperatures often pushing the triple digits play havoc with the region's electrical service. Sitting in the middle of this region is the 281-acre GlaxoSmithKline Research and Development campus in Collegeville, Penn., a suburb of Philadelphia.

A division of the world's largest research-based pharmaceutical company, the site's 10 building campus experiences at least four or five power outages a spring/summer. The site houses medical research aimed at eliminating some of mankind's deadliest diseases — a time-consuming and expensive process sometimes taking up to 15 years and over $500 million to develop.

Background

Built in 1992 by a pharmaceutical company later purchased by GlaxoSmithKline, the 1.1 million-square-foot Collegeville campus draws 12.5 MW of electricity on peak days. The majority of this power is consumed by the heating, ventilating and air conditioning (HVAC) system in order to maintain the strict environmental conditions.

The Rockwell Automation Power & Energy Management Solution installed at GlaxoSmithKline's Collegeville research facility monitors incoming power for level fluctuations and in the event of a power loss, the system re-powers the facility using onsite power generation capabilities.

According to Don Stuck, Manager Facilities and Scientific Instrumentation, GlaxoSmithKline Collegeville facility, the original campus design — which included a built-in SCADA system and power management system — never worked properly, and as a result, the campus would function for extended periods without electricity.

When GlaxoSmithKline bought the facility in 1995, the facilities management team immediately began to evaluate options for improving the site's power management capabilities. In 1996 Stuck and his team performed a SCADA system audit followed by an engineering study to determine the scope, complexity and costs of implementing a new power distribution system.

The extensive evaluation process involved looking at multiple variables and specifically identified how frequently downtime was occurring; how many instances the campus had been without electricity for extended periods of time; the damage caused to campus refrigerator/freezers and the expense (time and money) to repair; and the "upsets" in the process that would occur.

Based on their findings, Stuck and his team presented GlaxoSmithKline management with comprehensive data justifying the capital expenditure for a new power distribution system.

"We were having at least four or five complete power outages a summer, and once the team was able to attach dollar figures to the direct and indirect losses incurred by unplanned energy outages, management agreed that a newer, state-of-the-art power distribution system was needed," said Stuck.

Challenge

Taking into account the fragility of the research and the costs involved, GlaxoSmithKline quickly realized that even temporary power outages could result in the loss of millions of dollars in pharmaceutical research.

"With the ongoing experiments and data being collected at our facility day and night, as well as critical sample storage spaces, and manufacturing and computer systems, it's critical that we have power at all times," said Stuck. "If this facility were to experience electrical problems or power disruptions, it would put us at considerable risk of losing years of scientific data and research."

Solution

To protect the company's investment, GlaxoSmithKline teamed with Rockwell Automation's Power & Energy Management Solutions (PEMS) group to implement an advanced power management solution. This solution includes an emergency load shedding program used in conjunction with onsite diesel power generators. In the event of an unexpected power loss, the Rockwell Automation system will activate onsite diesel generators that will maintain continuous power to critical processes, such as refrigeration, heating and air conditioning.

Rockwell Automation's configurable power meters are critical elements of the power and energy management solution installed at Glaxo Smith Kline research facility in Collegeville, Pennsylvania"

Results

Stuck and his team began the process of selecting and implementing an energy management solution in the same methodical fashion as they did in justifying the need for one. They quickly determined that a new distributed power system would need to meet the facility's current demands, as well as accommodate future expansion.

"...it was Rockwell Automation's knowledge of both power and energy management as well as automation, that set them apart..."

More importantly, the system had to be installed with little or no impact on current operations.

As a way of measuring the success of the project, Stuck and his team identified specific project goals, which included replacing the existing system with little to no impact on building operations; staying within budget; minimizing complexity of the system; creating a new operator-friendly environment; installing a Y2K-compliant system, expandable for future growth and; utilizing fiber optic communications media as the basis for other facility management system integration with other networks.

When it came time to select a supplier, the Collegeville engineering team employed an equally thorough evaluation processes. After extensive product research, Stuck identified three vendors who offered the power distribution components he was looking for. The team then established specific vendor criterion. The company needed to have: 1) the ability to provide the equipment needed; 2) experience in power management implementation and; 3) background and expertise with automation controls.

From Stuck's perspective he was looking for more than a product supplier; he wanted a partner who would be there from start to finish and beyond. They found that partner in Rockwell Automation's Power and Energy Management Solutions (PEMS) team.

"Frankly, it was Rockwell Automation's knowledge of both power and energy management as well as automation, that set them apart from the other vendors," said Stuck. "Also playing a key role was their reliability and futuristic product growth path, including forward migration and backward compatibility."

In eastern Pennsylvania, Mother Nature begins to make her presence known in late April with spring thunderstorms and lightening strikes. For this reason, it was critical to have the new power distribution system up and running before another power outage season began. Working in tandem, GlaxoSmithKline Collegeville facility management personnel and Rockwell Automation PEMS application specialists developed a power distribution system that met the identified project goals and worked toward an April 1999 installation.

Engineered and programmed at Rockwell Automation's Mayfield Heights, Ohio facility, the PEMS solution underwent rigorous testing before it was shipped to the Collegeville campus.

To minimize disruptions at the research facility, the PEMS system installation was planned for a weekend in April 1999.

Once installed, an online test was conducted during a four-hour period. More than 25 individuals – contractors, consultants, engineers and internal maintenance personnel – were onsite to facilitate the final testing of the system. Installation was completed with only sporadic power downtime totaling less than two hours.

"It was Rockwell Automation's knowledge of controls, power distribution and electrical emergency generation that really made the difference," Stuck said. "The PEMS application specialists were with us every step of the way, working as a team to ensure that the project met all of our goals. They gave us constructive criticism and offered better methods for creating the system we needed."

Based on a SCADA system, the solution performs electrical power monitoring and emergency load shedding in conjunction with onsite co-generation capabilities. Through the SCADA system, the incoming power is monitored to detect level fluctuations. In the event of a power loss, an emergency mode is initiated.

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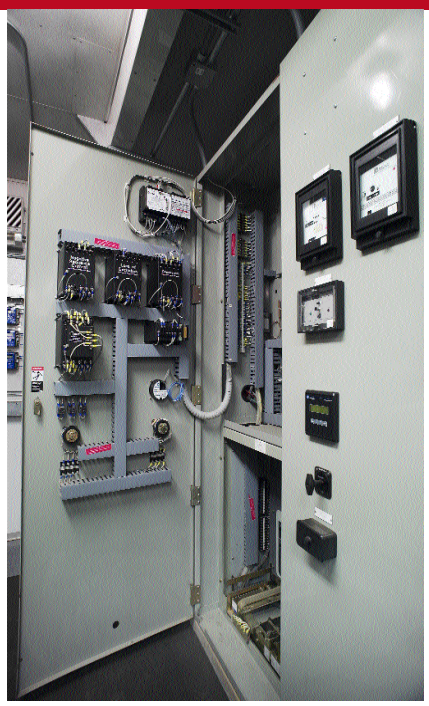
In emergency load-shedding mode, the system opens predetermined circuit breakers, starts six 2000kW stand-by generators, and re-powers the facility using onsite power generation.

The success of the system depends on its ability to gather and monitor critical electrical information, from the two 34.5 kV incoming PECO (Pennsylvania Electric Company) power lines down to the 480V substations and all of the transformers, generators, breakers, transfer switches and protective relaying. With this information, automatic or manual decisions can be made to ensure the availability of power to the critical loads within the application.

Additionally, the real-time monitoring of electrical usage within individual buildings enables facility managers to make better-quantified decisions when expanding or adding to existing electrical distribution system. Key components of the system include two redundant Allen-Bradley PLC-5/80™ controllers connected to 32 Allen-Bradley Powermonitor II™ power meters located at substations throughout the campus.

Used to collect electrical information on the substations within the system, the power meters communicate data to the central control cabinet located in the campus Central Plant building which also

Data gathered from the substations and incoming utility power lines is graphically represented using Rockwell Software RSView32 visualization software displayed on a large flat panel monitor. The system allows operators to quickly survey system status and the effects of transitioning to emergency power.



Power meters from Rockwell Automation are installed on each of the facilities eight-diesel generators.

houses the Honeywell DCS HVAC system.

The GlaxoSmithKline solution incorporates two communication networks — one for control functions (ControlNet™) and one for data acquisition (Ethernet). The Ethernet® network allows operators to troubleshoot the system from anywhere within the system. Ethernet was used because it can be incorporated into the campus' existing Ethernet infrastructure and can be easily expanded as the system grows. The ControlNet network connects the controllers, allowing for unrestricted and protected communication.

Data gathered from the substations and incoming utility power lines is graphically monitored using Rockwell Software RSView™ visualization software displayed on a large 42-inch flat panel monitor mounted on the control room wall. The system allows operators to quickly survey the effects of transitioning to emergency power and easily monitor generator status.

Using Rockwell Software RSPower32™ software, operators are able to manage system configurations and display real-time and historical data sorted within the power monitors. The adaptable nature of RSView32 and RSPower32 allows GlaxoSmithKline to create or modify screens in a matter of minutes — a time-saving benefit as the facility continues to expand.

Facility engineers have access to the system from two stationary operator interface stations — one in the control room and the other in the generator control trailer — as well as through an Intranet connection. Additionally, information can be pulled directly from the substations using a port on the Powermonitor II power meters for laptop connections.

After three years of operation, power interruptions at the campus have been minimal. And during those interruptions, the lengths of time have been limited to the less than three minutes before the onsite generators kick in.

"There hasn't been a time when a control system didn't get the generator online and loaded within three minutes," said Stuck. "With the previous system, the length of the blackout was dependent on when it happened. If it was during the day, we would only be down five to ten minutes because personnel were on site. But if it happened at 2:00 a.m., it would be upwards of half an hour or more without electricity. The new system drastically reduces the costly effects of power outages."

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