



"We present data so that operators can improve the manufacturing process ASAP, and managers can make the best business decisions."

William Radford
Head of Operations

Kansas City Power & Light Deploys Thin Clients and Portal Software to Create Browser-Based Economic Performance-Monitoring System

Kansas City, MO — Given today's hotly competitive energy marketplace, it isn't unusual for electric utilities to implement a high level of process automation so that management can produce power more efficiently and at lower cost. What is unusual, however, is for a utility to create Web-based performance monitoring systems that allow both management and plant operators to monitor and evaluate the economic performance of their production in addition to the power generation process itself. That's exactly what Kansas City Power & Light Company (KCP&L) has done at two of its generation plants near Kansas City by installing software from Wonderware, a business unit of Invensys Systems, Inc.

The Wonderware system helps make a significant difference in KCP&L's overall profitability in these difficult economic times. The new performance-monitoring systems collect data from multiple power production systems and store it in the Wonderware IndustrialSQL Server real-time plant historian, where it is then available to any authorized user, anywhere in the company, using standard Web browsers to view and analyze it via the Internet or corporate intranet.

Both operators and management can analyze the data to measure performance efficiency as production occurs, and the system allows staff to easily tailor how the information is displayed for specific individuals. Each plant employee is presented with only the information s/he needs to improve plant performance.

Technology Decreases Costs

The system was designed and installed by KCP&L with support from Segal, Inc., an engineering and system integration firm based in Stilwell, KS, that focuses on power plant and energy-related systems.

The Wonderware software included in the new system includes Terminal Services for InTouch software, the IndustrialSQL Server real-time plant historian and SuiteVoyager real-time portal software. The Terminal Services software is a thin-client version of the InTouch human-machine interface (HMI).



Power lines connecting to the Kansas City Power & Light facility



An operator monitors plant activity in KCP&L's control room.

The IndustrialSQL Server historian consolidates and stores the plant data. The SuiteVoyager software gives plant employees real-time access to the data.

This combination of thin-client and portal technology has not only decreased the cost of enhancing the original system but has reduced the life cycle costs associated with maintaining and enhancing it, because applications are maintained on a central server.

"For the first time, we can literally monitor performance from the plant-floor data sources all the way up to management desktops with one integrated set of applications," explained William Radford, head of operations at KCP&L's La Cygne plant, located approximately 40 miles south of Kansas City. "We gather the data, review it, modify it as necessary, and then present it to our managers and directors in whatever format they request."

This real-time plant intelligence is valuable to operators who need to know what they can do to make the process work better right now, as well as managers at all levels of the company.

"The managers need to know how well systems are working at any time, how well they've worked in the past, and how well they are expected to work in the future," Radford added. "With the new plant intelligence system, our managers know what the power demand is, how much capacity is available and what the power-production costs are at any given time. This is critical for making the best short-term decisions when electricity fuel prices are fluctuating."

Continuing Tradition of Innovation

Kansas City Power & Light is a leading provider of energy-related products and services for homes and businesses in the Kansas City metropolitan area, in both Missouri and Kansas. The company has four primary plant sites and 19 generating units that can produce more than 3,700 megawatts (MW) of electricity. Founded in 1882, KCP&L has become one of the Midwest's most affordable energy suppliers because of its leadership in fuel procurement and plant automation technology. The company is now a wholly owned subsidiary of Great Plains Energy, Inc. (NYSE: GXP).

Two of the more advanced KCP&L plants are the Hawthorne and La Cygne stations. Both have deployed performance-monitoring systems for several years, but La Cygne is the first to implement browser-based applications. The La Cygne plant has dual power-generation units. One is a super-critical unit that is capable of producing up to 870 megawatts of power; the other can produce up to 710 MW. Since its construction in the 1970s, the La Cygne station has used several different types of control systems to manage coal-handling, water treatment, boiler management and power generation, including Bailey and Honeywell distributed control systems (DCS) and automation systems based on Allen-Bradley and Siemens programmable logic controllers (PLCs).

"One of the critical elements in the development of the browser-based system was that we needed to merge data from all of these control networks," explained Bruce Kelly, Sega technical director for information technology. "In the past this hasn't really been possible because each network is proprietary in nature. However, by using thin-client applications, the real-time IndustrialSQL Server historian, SuiteVoyager plant portal software and the Internet Explorer browser, everyone can now see the data they need from any control system."

"The new system allows us to use a central server in a centrally-maintained environment, permitting 'clients' to log in and view an image of the data on the server," he said. "The beauty of this implementation is that the data image is different for whatever each person needs to see. It allows us to build specific information displays for specific individuals, yet we still manage plant operations using the existing control systems."



One of KCP&L's massive turbines used for power generation

Enhancing Standard Power Generation Systems

The La Cygne station is a modern coal-fired plant, but on a grander scale than most. Because the dual power generation units each consume four 100-ton rail cars' worth of coal per hour, at least two trains' worth of coal must be delivered each day. The coal is distributed in the storage yard via stacker/reclaimers, then conveyed to 1,000-ton silos that feed the boiler furnace system. The coal is a mix of 85% low-sulfur coal from Wyoming and 15% local coal supplies.

The coal is fed into mills where it's pulverized to powder form, for air-blowing into the furnace. Unit 1 is a massive boiler facility, standing 10 stories high. The powdered coal fuels a fireball that heats as much as 625,000 gallons of water per hour in the boiler piping, creating steam to power the three-stage turbine. Because the turbine rotates at supersonic speeds, sensors are placed strategically to monitor each blade to detect vibration that could destroy the turbine. The shaft rotation powers the generator, which produces the electricity.

There are several ancillary systems that support power generation, including water treatment, condensation systems for recycling steam into water, ash collection and recycling. Each of these has its own control system and each system's interaction with the others is monitored to ensure peak performance of all variables in the power-generation process.

"Our operators are among the best in the business; they really know the process," Radford said. "But we needed to do more than just control the process. This is a factory whose raw material is coal and it produces a

product: electricity. In that way, it's no different than any other factory. We can end up with a lot of cost or not very much cost, depending on how we control our resources.

"Not only do we have coal as a raw material, but we have labor and all the associated management costs, as any other factory would. We needed to put all those different sources of information, from different control systems and different equipment manufacturers, into one central system and provide access to that information to anyone who needs it."

KCP&L management started on upgrades to the La Cygne plant in 1996, when they replaced Unit 2's original analog controls with digital systems. Unit 1 was changed over in 1999. The original performance monitoring systems were installed in 1996 to acquire data and make it available on a data highway that could be accessed from anywhere. One of the problems was that the original implementation used separate instrumentation for data acquisition and control - and, while the control system was well maintained, the data-acquisition instrumentation generally was not. One of the initial tasks for adding a digital control environment was to acquire data directly from the control instrumentation.

The subsequent addition of the Web-based enhancements in 2001 and 2002 has made a dramatic difference in the plant's performance-monitoring capabilities.

"Our previous performance monitors were thick-client applications," said Tor Anderson, Sega's manager of information technology. "The program ran on a specific machine and was only available for viewing on that machine. Now, by running it from a Terminal Server and making it available via a web portal, various users can look at the same information at the same time and get exactly what they need.

"It's also been very cost-effective to deploy thin-client applications because you can use less expensive hardware, all running the same software off the central server," he added. "That approach makes it easier to maintain, as well. When you have thick-client applications running on numerous computers, you really don't have the same program running everywhere; there are always variations. Having the program running on one server means it's the same program for everyone."

Real-Time Benefits

"Knowing the performance and health of your plant on a real-time basis is becoming very important, given the competitive nature of power generation," Kelly noted.

"Power plants generate tons of data in addition to electricity - but unfortunately that data isn't always available to the managers who need to make decisions. And it's not always available in a form that allows them to make decisions. A key component of what this system does is render the data into useful information and present it to the right people at the right time for them to make the most informed decision.

"If you're a regulated utility like KCP&L - which also supplies a sister company called KLT, Inc. that supplies power to customers around the United States - you must have a dispatch center that knows what's going on and keeps close tabs on production," he said.

"If you don't know that a plant is down until you get a phone call an hour after the event occurs, it can be very costly. Whereas, if you have a performance monitor system like this in place, you will immediately know that the plant is down. Plus, you can see exactly what each production unit is doing in real time and can respond quickly if there's a problem. This is critical for a producer that has commitments to deliver power."

It's also important for making sure KCP&L makes money with its generation processes. The Web-based performance monitoring system now offers as many as 50 different operator screens that allow them to visualize, analyze and optimize the process in real time.

"There's a balancing act in the production of energy that can make a huge difference in whether you're making money," Radford said. "For example, you can use some of your turbine steam to pre-heat the boiler water so steam production is enhanced. If you take too much steam off the turbine, it may reduce the volume of electricity you're producing. But, if you use only cold water in the boiler to make the steam, your fuel cost rises because you have to heat the water more. There's a point in the cycle at which you can optimize the levels of steam and heat energy without hurting your power generation that much, and you get a big benefit in the boiler stage because you've pre-heated the water before

it enters the boiler. Being able to monitor performance that closely, so that you can fine-tune the process, can truly make a difference in your profitability."

The new performance system has been paying dividends like this since the first moment it came online at La Cygne.

"As soon as the system went live, an alarm went off that there was a problem with a piece of equipment it was monitoring," Kelly said. "The operators hadn't been aware of it because, on their screens, the data showed everything to be normal.

"The problem was that, previously, their data wasn't detailed enough to bring out what was wrong with a single piece of equipment in the production stream," he explained. "We discovered that there was a feedwater heater that had a baffle missing; water was bypassing it. We immediately informed management. Operators brought the unit down to a lower load that night, fixed the baffle and put the heater back in service. So the system really paid for itself within 60 seconds of being started up.

"That's the ultimate benefit of performance monitoring - the system reduces uncertainty by providing information to the individuals who need it to perform their jobs," Kelly concluded. "That's critical and that's why we used Wonderware plant intelligence tools, including InTouch, IndustrialSQL Server, SuiteVoyager and Terminal Services for InTouch software. That combination gave us the technology to get the job done, and get it done well."



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