Solutions

- **Load profiling and cost allocation**
  - – Status reports track energy consumption and pinpoint savings opportunities
- **Power quality monitoring**
  - – New system senses, displays and records power quality information.
- **Distribution system monitoring**
  - – Engineers view distribution system behavior in real-time to quickly pinpoint abnormal conditions.
  - – System enables faster recovery from power outages.

Results

- **Cost savings**
  - – $52,000 annual energy cost savings
  - – $220,000 upgrade savings
- **Easier maintenance and troubleshooting**
  - – Engineers have access to real-time plant status information
  - – Improved plant uptime
- **Improved data collection**
  - – Automated system generates reports tracking consumption and cost allocation
  - – Historical trend data helps conserve energy costs and monitor cost savings

Rockwell Automation helps wastewater treatment plant optimize its electrical distribution system

System provides real-time status reports to help users identify consumption trends and find opportunities for energy cost savings

Background

The Hyperion Wastewater Treatment plant in Los Angeles is one of the three largest wastewater treatment facilities in the United States. Since it began operations in 1925, the Hyperion plant has undergone several major upgrades to become a full secondary treatment plant. Today, with the capacity to process 450 million gallons of flow each day, Hyperion serves more than 4 million residents and thousands of businesses in the Los Angeles area.

Wastewater comes to the Hyperion plant via 6,500 linear miles of underground pipes – enough pipe to build a tunnel between Los Angeles and Taiwan. Nearly all of the wastewater comes from residences: water from sinks, dishwashers, bathtubs, toilets and washing machines.

Each day, the 144-acre site processes millions of gallons of wastewater, removing 90-95 percent of the solids from the wastewater; the treated wastewater is called effluent. Most of the treated water is discharged into the Santa Monica Bay through a pipeline that extends five miles out into the bay, reaching a depth that ensures the effluent will not return to shore. About 6 percent of the effluent is routed on to a water reclamation plant, where the water undergoes another level of purification. This treated water is used to irrigate golf courses and parks.

In addition to treating wastewater for safe disposal and reuse, the process at the Hyperion plant also generates biosolids used by farmers to improve their soil's fertility. And the plant captures methane gas generated for use at a nearby power plant.

Challenge

Plants that operate at such a large scale consume a considerable amount of energy. In an effort to curb operating costs, the City of Los Angeles created an energy conservation initiative designed to increase plant managers' awareness of energy consumption, and use system information to improve trouble-shooting and prevent plant outages.

The existing data collection methods at the Hyperion plant were outdated. Each meter in the plant had to be read manually, with charts and reports managed on a simple spreadsheet. Power quality events were spot-checked using two portable meters to gather data from the plant's 116 substations. Checking the field switchgear required electricians to visit the switchgear in the field. Even emergency procedures required manual field operations. With a constant turnover of new electricians (20 hired in the last five years), this meant a significant amount of time spent training each new employee on all of the plant's cumbersome manual procedures.

To meet the requirements of the new energy conservation initiative, the Hyperion plant needed an automated system that could monitor power consumption and present real-time status reports.

Solution

Rockwell Automation used a project engineering process to help guide Hyperion through the upgrade. The process began with an onsite kickoff meeting where Rockwell Automation engineers could gather information about the plant's specific needs.

Using the kickoff meeting information, Rockwell developed a functional specification for Hyperion to review and approve. After both parties finalized plant specifications, hardware drawings were reviewed and approved. For this project, Rockwell recommended using a combination of Allen-Bradley® Powermonitors™, PLC™s, SLC5/05™s, RSView™, RSEnergyMetrix™ and RSPower32™.

"Rockwell Automation's project engineering process was one of the main reasons we chose them as a vendor," said Bahram Roshanian, electrical engineering associate, Hyperion Wastewater Treatment Plant. "And, with their experience in power system operation and control, we knew we had the best system in place for the Hyperion upgrade."

Rockwell Automation designed a new supervisory control and data acquisition (SCADA) system, including 116 Powermonitors to measure power flow, and nine programmable controllers. Hyperion Treatment plant personnel designed, programmed, and installed the network portion of the SCADA system using 33 Ethernet switches, and four routers. Some 6,000 feet of fiber optic cable was used to network the system back to the RSView, RSView Active Display and RSEnergyMetrix servers. Several control rooms were consolidated to one location, giving plant operators a broader view of plant operations. HMIs were used to collect data from each substation bus and control every breaker in the facility.

Results

Information collected from the Powermonitors is relayed back to the RSView and RSEnergyMetrix servers for control and analysis.

The RSView server senses, displays, records, trends and alarms on power quality information such as: voltage excursions (dips, sags and spikes); momentary power loss; phase loss and reversal; and harmonic analysis (IEEE 519, TIF, THD, K factor, crest factor).

Additional information is also immediately accessible, such as power flow, voltage (current and frequency), distribution system equipment status, system topology and relevant process equipment status. The system shows real-time distribution system behavior to help engineers quickly pinpoint abnormal conditions and facilitate faster recovery from power outages. Scalable and flexible for multiple monitoring and control functions, such as emergency load shedding and tie-line control, the system also enables manual or automatic remote control of switchgear and other electrical equipment.

The new automated system integrates generator operation with transfer, paralleling and distribution switchgears, providing protective relaying. With these combined operations, engineers have greater control over the generator systems in terms of faster startup and shutdown, tighter power, voltage and frequency regulation, and quicker response to abnormal conditions.

Hyperion uses the RSEnergyMetrix to track energy use by process area and refer to historical trend data to conserve energy and monitor cost savings at the plant.

Using data from the new SCADA system, RSEnergyMetrix generates reports that track power consumption to details such as kilowatt demand for selected meters or groups, and "worst case scenario" peak demand. Plant engineers also can use RSEnergyMetrix to run billing reports for selected meters, allowing them to track charges and detail the quantity and rate of consumption.

The RSEnergyMetrix cost allocation reports can display a two-dimensional array of line items and charges for selected meters or groups, along with subtotals and a grand total.

Energy cost savings opportunities were identified quickly with the new system. For example, energy logging data showed one clarifier in the system was using almost twice the energy that other clarifiers used. When comparing the speed of the clarifiers, engineers found that the abnormal clarifier was set at a higher speed than others. The speed was adjusted, saving the plant $33,000 annually.

Hyperion also uses the system to measure potential savings from upgrades. In one case, engineers found that they needed to order only half the number of 100HP drives they thought would be required for an upgrade project. Scaling back on the order saved $220,000.

The automated system also allowed the plant to take advantage of other energy cost savings, such as shutting down the maintenance and office buildings' HVAC system during off-hours. This step allowed Hyperion to reduce its energy bill by $19,000 annually.

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