Success story
Water Treatment Plant

Market Served
Government/Water/Wastewater

Eaton upgrade bolsters reliability, energy efficiency at water plant

Location:
Southwest, U.S.

Segment:
Water treatment

Problem:
The customer's aging electrical equipment with out-dated control systems provided an opportunity for utilizing latest technology to gain increased system reliability and extend facility life-cycle well into the future

Solution:
Eaton 5kV switchgear lineups, 5kV motor starters and 480V distribution, all with updated automation systems designed, engineered and implemented by Eaton's professional services team provided this facility's retrofit project with a solution that serves them for decades to come

Results:
Working with Eaton, the customer was able to completely overhaul its electrical infrastructure, improving reliability, electrical efficiency and backup power resources at the facility

"Eaton has the in-house capability to take on greenfield or retrofit projects such as this, with engineers and project management, who can manage the entire process."

Greg Hand, Eaton PSC engineering manager

Paralleling switchgear control station

Background

The water utility is committed to protecting public health by providing high quality water and safely disposing of wastewater in a cost-competitive manner. The utility operates two water treatment plants. Throughout its various facilities, the customer remains focused on improving customer service, planning for future needs and continuously striving to upgrade its systems.

Challenge

While a 2010 expansion had expanded the water treatment plant's drinking water production capacity to 97.5 million gallons a day, they recognized that after nearly 30 years of operation, the facility's electrical systems needed to be updated.

Following the approval of funds for the upgrade, the project was put out to bid. The scope of the upgrade included the demolition of outdated electrical equipment; installation and startup of new electrical equipment including switchgear and transformers; completing miscellaneous instrumentation and controls work to improve operation of the electrical system and the treatment plant; and construction of an environmentally controlled building to house much of the new equipment.

Within the project, the customer sought a number of improvements, including greater energy efficiency to yield long-term savings on operation and maintenance costs, as well as a solution capable of properly interfacing with two existing Kohler generators on site. Furthermore, they wished to engage an organization that was able to not only provide the breadth and depth of a proven product line, but also an in-house team capable of overseeing the entire project

Solution

One of just four manufacturers approved to compete for the bid, Eaton's Electrical Engineering Services & Systems was awarded the plant upgrade. Offering a comprehensive portfolio of services and solutions—custom tailored and optimized for every stage of a power system's life cycle—the Eaton team was able to address the specifications desired by the customer. The engineering services team was comprised of field service engineers, protection engineers and control engineers all specialized in the implementation of complex power systems.

Instrumental in the project design was Eaton's Power Systems Controls team, which provides customized automation and control solutions that enable customers to operate electrical power distribution systems more safely, reliably and intuitively. By providing engineering design, program development, implementation and testing for all power system

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applications, Eaton was able to take the project from conception to final field start-up and commissioning.

The Eaton team completed a coordination study, comprehensive testing and installation of all equipment. "It was truly a complete package," emphasizes Greg Hand, power system control engineering manager. "Eaton has the in-house capability to take on greenfield or retrofit projects such as this, with engineers and project management, who can manage the entire process." he adds. "And compared to other companies, we aren't tied specifically to a generator or control system manufacturer, so it gives customers more freedom of choice."

The project entailed a rip-and-replace of the plant's generator paralleling switchgear while maintaining two existing 2500 kVA diesel engine generators, explains Eaton Sales Engineer Ryan Schlabs. Noting that the plant's original switchgear was outside and exposed to the elements, Schlabs says that a new electrical facility was constructed to interconnect with existing plant loads. Within the setup are three 5kV switchgear lineups, two of which are utility main switchgears and the last is a generator paralleling switchgear lineup.

Control panel closed

The system's controls were provided in free-standing control cabinets which include 24-inch touchscreen HMI's, a M580 Hot Standby Master PLC combined with standalone M580 PLCs, all which are utilized for synchronization and load share control for the plant's generators. Multifunction relays were utilized for breaker protection and control operations. Eaton provided 5kV motor starters for protection and control of the plant pumps and provided new 480-volt distribution switchgear. In addition, updated programmable logic controllers facilitate communication with the plant, sending signals to all electrical gear and providing operators with real-time power consumption information.

Eaton also incorporated several specialized features into the plant, such as walk-away timers that allow an operator to press a button on a breaker's protective relay to open or close the breaker. Once the button is pressed, an LED will blink, alerting the operator that a procedure is imminent and providing ample time for personnel to move a safe distance away.

As a result of the upgrade, overall reliability was bolstered at the treatment plant, total number of electrical meters reduced, while the number of incoming power routes was increased.

With the installation of new soft-start motor controllers for the high-service pumps, the startup demands on the electrical system were alleviated, enabling all treatment equipment to be used from the existing generators. The soft starters also allow the plant to require fewer emergency power generators than would have been needed with typical motor starters.

The plant's new electrical building decreases overall maintenance requirements for the electrical gear and equipment, increasing the lifespan of the machinery. The new motor starters place less stress on the water pump motors at start-up, increasing motor lifespan.

In addition to the newly designed solution functionality and high quality of the specified electrical equipment, Eaton's ability to oversee the upgrade from inception through completion proved paramount to the plant's electrical retrofit success—especially considering several hiccups along the way.

Eaton's District Support Engineer Jeremy Hey was on top of any issue. "Jeremy caught a lot of things and was able to successfully navigate the customer through each one," notes Schlabs.

To begin with, several of the remote PLC panels needed to interface with the switchgear lineups arrived with shipping damage. Hey immediately completed a damage assessment and submitted a parts list to the appropriate personnel. Another issue was that many of the doors on the front of the gear would not close properly, so Hey modified them to resolve the issue.

Following the completion of the electrical project, the water treatment plant began producing water for residents in about six months. Expected to yield long-term savings on operation and maintenance costs, the upgrade also included the controls required for the plant to connect a third generator to the system in the future.

The reliability of the revamped system was put to the test shortly after installation when a lightning strike hit a utility meter. "The system responded exactly the way it was supposed to, and everything transferred over," explained David Hollis, PSC Engineer and project lead

Results

With an expected lifespan of 30 years, the new Eaton electrical gear will carry the plant well into the future. "Even more, Eaton is able to support the lifecycle of the equipment from cradle to grave," notes Schlabs. "The customer can rest easy knowing they have local Eaton technicians maintaining the equipment and available if any issue arises."

Thanks to the Eaton upgrade, the customer has been able to:

- Increase reliability at its water treatment plant
- Decrease overall maintenance requirements while increasing equipment lifespan
- Gain real-time power consumption information through updated programmable logic controllers
- Gain peace of mind knowing Eaton will service the equipment through the entire lifecycle

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