

Integrated system provides temporary bypass at Colorado treatment plant

Custom-designed solution offered project team remote bypass control and monitoring

Project

In Colorado, the project team for an expansion and renovation of a wastewater treatment plant was in need of a bypass system to move a peak flow of 128 million gallons per day. Wagner Rents, the rental arm of Wagner Equipment and Xylem's Godwin and Flygt distributor in Colorado was named the bypass contractor for this portion of the job. Wagner Rents pump team worked with Xylem to design and install a temporary system to convey the full amount of flow. The solution that followed also provided the treatment plant with the ability to integrate the temporary bypass into its SCADA system and to log the data as if it was its own permanent pumping system.

"The project specifications were fairly open, but what we needed to do was take the influent flow from the headworks, after it went to the primary clarifiers, to the aeration basin," said Clyde Refvem, Pump Specialist for Wagner Rents. The ultimate need was for a pumping bypass system that was capable of handling at least 64 MGD as well as an additional 64 MGD for high-flow conditions and backup pumping, totaling a max flow capacity of 128 MGD.

The Wagner team worked with Xylem on a bypass system design as the expansion and renovation of the plant progressed and initial specifications were modified. "The overall project had gone through several design iterations," said Refvem. "It's a design-build project, so at the time of bid we had a concept. But how we built the actual project was significantly different, due to design constraints and criteria put forth by the contractor."

The initial design called for a standard diesel/electric drive combination, but factors such as the depth of the water versus the grade forced Refvem and his team to use electric submersible pumps instead. "It was determined early on that this job would not be performed with the diesel-driven end suction pumps that we typically use," said Steven Rock, Controls Design Engineer for Xylem. "There was approximately 32 feet of static lift on this location, and the jobsite was 5,100 feet above sea level in elevation. This led us to using Flygt electric submersible pumps, which best fit the requirements of this application."



Six Flygt electric submersible pumps were installed at this site in Colorado, responsible for a max flow capacity of 128 MGD. The pumps' discharge was fed into eight different lines to bypass the plant's operation containing chemical and biological processes.

CUSTOMER: Wagner Rents, for a customer in Colorado

CHALLENGE: Provide a temporary bypass system to convey up to 128 MGD at a major wastewater treatment plant while the plant underwent expansion and renovations.

PRODUCTS: Godwin 450HP variable frequency drives, Flygt 3531 electric submersible pumps, MJK 24-in. flowmeters, Godwin advanced remote monitoring and control panels, and Flygt MAS 711 pump monitoring system

RESULTS: The integrated electric submersible bypass system operated continuously for nearly seven months and allowed the project owner and contractor to monitor flow rates and responses in real-time from any location.

Solution

The electric submersible bypass system installed by Xylem and Wagner at the metropolitan site included six Flygt 335 HP electric submersible pumps on six Godwin 450 HP variable frequency drives (VFDs). Wagner provided a 1-megawatt CAT diesel-driven generator for the system, as the municipality only had enough line power available to drive three of the six pumps. "All of the pumps' discharge also had to go into a common header that was split into eight separate lines in order to bypass the part of the plant's operation that handled chemical and biological processes," said Rock. Eight 24-inch MJK flowmeters were placed on the discharge lines to allow the balancing of flow via discharge valves to the eight discharge locations.

The treatment plant's owner also needed to be able to check whether each part of the system was running smoothly for the duration of the bypass, so two Godwin advanced remote monitoring and control panels were provided to continuously collect data from the VFDs, flowmeters and transducers. Xylem's engineering team, led by Rock, developed a custom SCADA system that connected all six VFDs, pump sensors, flow meters, and level transducers. Once the data was aggregated onto a programmable logic controller (PLC), the system data was integrated with the municipality's own SCADA system through an OPC server, an industrial data exchange system for process controls.

Results

The system started bypassing in mid-March 2014, and ran 24/7 until September, said Refvem. It was set to emulate the response and flows of the plant's permanent equipment, and remote connectivity allowed the various parties involved with the construction project to continually monitor the pumps from any location. "Should a pump have any issues or problems, that system was designed to shut the VFD down so the pumps would not be irreparably damaged," noted Rock. "All that equipment, again, was networked back together to one common controller. With the addition of a cellular modem and webserver, we were able to provide all the information on the entire system to our customer and to Xylem, enabling us to monitor the system in real time from remote locations."

Xylem's customer, Wagner Rents, noted the ease with which anyone involved in the expansion project could take a look at the SCADA system and see how the bypass was doing. "Having that level of communication in which the owner, the contractor, various parties with the contractor, et cetera, could look at any given time and see what the flow was and see which pumps were running, became a big operational plus for us as we went forward," said Refvem. "It has made us more visible in the water and wastewater market, saying that 'We have this type of technology available and not everybody else does.'"



The Godwin 450 HP variable frequency drives also installed on site are connected with the plant's own SCADA system, custom-developed by Xylem.