MITSUBISHI ELECTRIC
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CASE STUDY

BOWLING GREEN MUNICIPAL UTILITIES

The Incredible Value and Rapid ROI of VFDs

Bowling Green Municipal Utilities' (BGMU) most famous landmark sits atop Reservoir Hill in Bowling Green, Kentucky. Its one-of-a-kind paint design is like no other water storage tank in the country. The image of the tank is found on postcards, stickers, license plates and logos throughout the city.

When the tank needed to be taken out of service and repainted, BGMU had to devise a method to maintain water pressure for the pressure zone it served. They planned on using the water pump station that normally fills the tank to supply water directly to the system. For this process to work, the pumps would have to be controllable to allow a decreased water flow at times when demand for water was lower in the zone.

BGMU also wanted to fix the sporadic amperage spikes they had been experiencing. The spikes were triggering a breaker in the pump station to trip, but BGMU couldn't isolate the cause of the problem. They thought it might be a hydraulic surge that was causing the soft starters to experience high amperage, which would then trip the breakers.

So began BGMU's Stars & Stripes Water project. The goal of the project was to replace the soft starters with Variable Frequency Drives or VFDs, so BGMU could control the pumps and run them 24/7 on a proportional-integral-derivative (PID) loop for continuously moderated control.

BGMU
Bowling Green Municipal Utilities
CONNECTING BOWLING GREEN

The freshly painted water tank and upgraded pump controls in Bowling Green, Kentucky now delivers water in a more energy-efficient fashion.

A Seamless Transition to a Superior Product

BGMU had already migrated some of its submersible sewer pumping stations to Mitsubishi Electric VFDs. They started installing these drives in their collection system panels in 2013 and thought it would be a good idea to migrate their potable system water pumps as well. They would get the added benefit of being able to use the pumps to maintain discharge pressure and supply potable water on demand while the water tank was being repainted.

They originally decided to use Mitsubishi VFDs in their wastewater collection pump panels because it gave them a higher heat rating versus other manufacturers. That meant they wouldn't have to install air conditioning in the panels. For this project they opted to use the Mitsubishi Electric FR-A800 VFD to avoid the need for additional air conditioning within the existing pump station.

BGMU felt comfortable with this decision because of their past experience with Mitsubishi Electric VFDs and because of their long-term relationship with Air Hydro Power. For over a decade, Air Hydro Power has supplied essential products to BGMU, including Variable Frequency Drives (VFDs) from Mitsubishi Electric.

Ed Grayson, BGMU's instrumentation and controls specialist says, "Air Hydro Power helped us size the drive for the application. Mitsubishi Electric helped us engineer the drive to meet our specific requirements."

Mitsubishi Electric also helped BGMU install a fail-over sensor and then program that into the controllers to ensure redundancy with an existing sensor. To ensure there was no interruption in service due to power outages, BGMU installed a stand-by electrical generator at the pump station.

Ed says, "The whole process was seamless. Everything was controlled and operated by the VFDs. We never had any issues with the diversion system." Transitioning back to the water tank was seamless too. Everything went as planned.

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A Pleasant Surprise – Energy-efficient Performance

After the VFDs were installed, Ed and his team were in for a surprise. "Our Electric Division metering department came to me and said the electric meter at the pump station wasn't recording properly. They actually changed the meter but the 'problem' was still there."

As it turned out, there was nothing wrong with the meter. The VFDs had eliminated the sporadic spikes they were experiencing with the soft starts. Ed says, "We were being billed for those crazy spikes. Once the VFDs were installed, that all went away and there was a significant decrease in peak demand billing."

Elimination of the energy spikes reduced peak demand by as much as 80%, this was a bonus that provided some energy savings for the utility. It also delivered a rapid return on investment (ROI) — a roughly 2½ year payback of BGMU's investment in VFDs.

Replacing the soft starters with VFDs also means less equipment downtime and longer equipment life. Ed says, "When you program a drive to slowly ramp up and slowly ramp down, you're taking a lot of the wear and tear out of the equipment. It's a better type of control. It also prevents water hammer in the distribution system, reducing the frequency of leaks and line breaks." The VFD's ability to accelerate and decelerate control gives BGMU the ability to dampen the hydraulic surge. Ed says, "That, in my opinion, was the cause of the amperage spiking issues we were seeing with the soft starters control setup."

Ed says, "A lot of U.S. water utilities are in the same boat, even though they may not know it." When asked if he'd recommend replacing soft starters with VFDs Ed says, "The cost gap between drives versus the soft starters has really closed. VFDs are more affordable than they used to be and they have been field tested to improve reliability. I would advise other utilities to try them for the energy efficiency, the motor protection and feedback functionality you get from a drive versus soft starters."

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Learn more about BGMU:
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