

Case Study

Modernized municipal water management system delivers more reliability and operational visibility, plus big energy cost savings



- **Customer:** City of Hobbs, NM
- **Challenges:** Outdated water production and management system lacking reliability, operational visibility, and energy efficiency.
- **Solution:** Single-sourced, standardized Totally Integrated Automation (TIA) solutions from Siemens, designed and engineered by Tesco Controls, and installed by Alpha Southwest.
- **Results:** Greater automation, visibility and reliability, plus big energy savings.



In the dry desert climate of southeast New Mexico, water is a precious resource. But that's hardly news to the team members who make up the Water Production and Water Reclamation Divisions of Hobbs, New Mexico, a city of 34,000 people not far from the Texas border. Their mission is to ensure residents and businesses have plenty of safe, clean water every day. In fact, they do a consistently good job of it, having twice in recent years won the state's highest award for water and wastewater management.

"We're proud of the work they do and the well-deserved recognition they have earned," says Frank Crane, the city's water production supervisor. "Although it's easy to take the quality and reliability of our water supply for granted, both are the result of good planning, investments in smart technologies to support our water

production wells and delivery systems, and community compliance with our annual, four-month water restrictions in the summer season."

Water for the City of Hobbs is drawn from 29 production wells that tap into the vast Ogallala Aquifer beneath it. To manage delivery to citizens and businesses, the City maintains five ground-based water storage reservoirs with more than 9 million gallons of capacity; three elevated tanks totaling 2.1 million gallons of capacity; five booster pump stations with 14 booster pumps; and several flow control valve sites.



HydroRanger 200 HMI is an ultrasonic level controller that provides control, differential control, and open channel flow monitoring.

Challenges:

Outdated water delivery management system lacking reliability, operational visibility, and energy efficiency

According to Peter Zacharius, SCADA Manager for the City, the water production and delivery system's original SCADA system, along with all of its automation components, was initially installed more than 20 years ago. "The City started the project back in 1998, built it in 1999, then launched it in 2000, just after the Y2K scare had passed," he says. "But in the first 10 years of use, we had to deal with multiple points of failure and a lack of standardization."

Zacharius adds the system had many other shortcomings, as well. "We were lacking visibility into our pumping, leak detection, well and reservoir levels, and various operating parameters," he explains. "If a pump motor failed, it could be hours before we would know. Our radios were failing, and we were finding it hard to get spare parts. Ultimately, we determined the system couldn't be upgraded and needed a full modernization."

Utility costs were another big issue the City wanted to address with a modernized water delivery management system. "Only 25 percent of our electric bill was for consumption, while 75 percent was penalty-based, non-consumption, demand charges based on a 15-minute rolling sampling window each month," he says. "So, whatever our highest power usage was in a single 15-minute period during that month was what we paid for all our power for the entire month. That amounted to hundreds of thousands of dollars spent each year that, for a city our size, could be better spent on citizen services."

Solution:

Single-sourced, standardized Totally Integrated Automation (TIA) solution, including WinCC-OA SCADA-HMI software, TIA Portal engineering project software, SIMATIC S7-1500 PLCs, SINAMICS G120 VFDs, SCALANCE network components, and RUGGEDCOM RF communication devices



Control room with two operator stations.

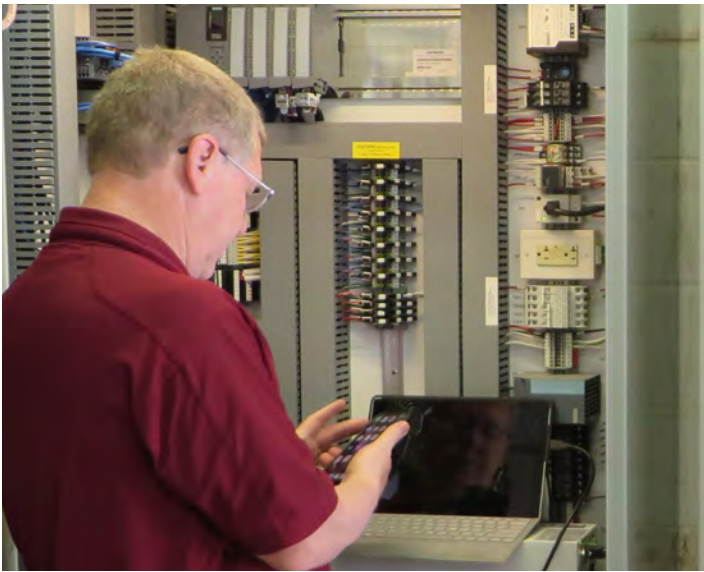
The City realized modernizing their water production and delivery management system would be a complex project needing expert outside assistance. For help, the City issued a request for proposals (RFP) to numerous systems integrators and engineering, procurement and construction (EPC) firms.

A five-person selection committee that included three citizens, evaluated the responses and chose Tesco Controls, Inc., a Siemens Solution Partner based in Sacramento, California, as their engineering and integration partner. TESCO is the largest privately held water/wastewater-focused automation systems integrator in the U.S. with 14 offices nationwide and over 400 employees, including more than 150 engineers. TESCO delivers end-to-end automation and control system solutions, including direct-to-owner engineering, fabrication, and system support.

"TESCO wasn't the lowest bidder, but cost was just a minor part of our criteria," Zacharius says. "We wanted not just a vendor but a strategic partner who could help us standardize on a complete Siemens solution, with which we were already familiar from our earlier SCADA system."

Getting operations engaged. Michael Prosser, TESCO's director of special projects, initiated the City of Hobbs engagement by implementing a collaborative design-build process that included the City's water operations team, Alpha Southwest, Inc., for installation, and the Siemens automation group. "It's especially critical to involve operations personnel early on, because they know better than anyone what a system's current shortcomings are and, just as importantly, they'll be the ones using the solution for years to come," says Prosser.

Working closely with all three parties, Prosser and Zacharius set forth their project design goals: standardization; improved reliability; enhanced data analysis capabilities; more operational flexibility; and a safe, cybersecure system. "We also sought to add extra value with integrated data analytics and system diagnostics," says Prosser. "What's more, radio and network communications had to be more robust and reliable, plus we



or a subsystem’s connection to it goes down,” Prosser says. “Without good, reliable communications, you’re nowhere.”

TESCO also designed and engineered integrated data analytics to help the City gain even greater operational visibility, especially groundwater management and leak detection. “We installed well-level transducers coupled with analytics tied to the VFDs, so the City can better watch the aquifer and manage groundwater more efficiently,” Prosser says. “Integration of data from the City’s AMR (automatic meter reading) systems is planned for the future, so the City can be sure to get paid for what they’re pumping out of the ground.”

To improve energy efficiency, TESCO engineered a careful throttling and start-up sequencing of pump motors and VFDs at booster stations. “We never start two motors at a booster site at the same time, using the SIMATIC S7-1500 PLCs for control,” he says. “And we run the VFDs gently up and down, modulating them carefully enough to keep the energy consumed during each of the 15-minute sampling periods as low as it can be.”

Results

Greater automation, visibility and reliability, plus big energy savings.

Zacharius reports the modernization of the City’s water production and delivery system went well, with kudos to TESCO for its design, engineering, and project management; Alpha Southwest for the field installations; and the Siemens group for its technology, products, and expertise as needed.

“By standardizing on the Siemens TIA portfolio, we’ve tremendously simplified our operator training, maintenance, spare parts and so on.”

Peter Zacharius

wanted to improve energy efficiency, groundwater management visibility, and leak detection capabilities. Ultimately, we wanted the City to be able to maximize its dollars-per-gallon-pumped.”

Prosser notes the RUGGEDCOM wireless network uses a licensed 4.9 GHz public safety frequency for implementing wide-area communications via the 802.16e WIMAX protocol. “We were the only company responding to the City’s RFP that proposed and conducted a spectrum analysis,” he says. “The City can’t afford to have their water system’s communication network be subject to interference from other radio frequency users operating in the very same frequency spectrum. Nor does the City have the wireless network expertise to troubleshoot things if communications failed, so we designed and engineered the network to be resilient and virtually trouble free.”

Key alignment for process control. In addition, TESCO’s engineers aligned the process control communications with the water system’s five hydraulic subsystems. “Because the communications in each one of the subsystems is autonomous, process control can continue, even if the central SCADA system

To design and engineer the solution, TESCO used the following Siemens TIA components:

SIMATIC WinCC	Open Architecture (OA) SCADA-HMI software, deployed on redundant servers
SIMATIC S7-1500 Series	Programmable logic controllers (PLCs)
SIMATIC TIA Portal	A common software engineering framework
SIMATIC PG	Industrial PC laptop
SITRANS LUT430	Ultrasonic level instrumentation
SINAMICS G120	Variable frequency drives (VFDs), installed on each of the 29 well pumps
SIMOCODE PRO	Motor-management modules, installed on 14 existing booster pump VFDs
SITOP PSU 100S	24VDC industrial power supplies, installed in each RTU cabinet
RUGGEDCOM WIN 7200	Base station units
RUGGEDCOM WIN 5200	Remote subscriber units
RUGGEDCOM RP100	Power-over-Ethernet (PoE) Injectors
SCALANCE	Managed Ethernet switches, Layer 2/3



SIMATIC WinCC Open Architecture (OA) SCADA software provides an operational dashboard with system-wide visibility that the City of Hobbs never had before.

“TESCO did a great job engineering it all for reliability, high availability, and resiliency, along with thoughtful cabinet fabrication. And Alpha Southwest installed everything on-schedule and budget. The collaboration, cooperation, and communications among everyone couldn’t have been better.”

TESCO, working collaboratively with the City’s operations staff, made several process improvements along the way. Chlorination, for example, used to be an all-or-nothing process across all the wells in any of the five production subsystems. “We realized immediately during upfront engineering that the City lacked the ability to properly control their chlorination systems, forcing technicians to manually adjust values in the field,” Prosser says. “But now, they don’t, which will help improve water quality, as well as saving the City time and labor that the field technicians can devote to other activities.”

The SIMATIC WinCC OA SCADA software, in combination with built-in, web-based remote diagnostics of Siemens TIA components, has been a huge boost to operational visibility and issue resolution. Figure 4 above shows an operations dashboard that provides an at-a-glance view of the entire system’s hydraulic state.

“I can securely access this dashboard from just about anywhere and on any device,” says Zacharius. “This saves me

and everyone with access to it a lot of time, not to mention peace of mind. And the remote diagnostics saves us from having to dispatch someone into the field, when we can more often troubleshoot and resolve a problem from our desks or from the comfort of our home when needed.”

Importantly, the TESCO-Siemens water production and delivery solution provides the City with energy efficiency it lacked previously – providing substantial cost savings from lower utility bills that will more than pay for the system’s modernization. “By eliminating our penalty-based demand charges with the much greater control we have over our pumps and their associated VFDs, we’ll be saving several hundred thousand dollars a year,” Zacharius says. “That’s money we can put to better use in the community and to serve our City more efficiently for decades to come.”

Collaboration from all sides proved to be the success behind this effort. “The Hobbs project was the perfect example of working with an incredible Siemens Solution Partner, Tesco Controls, and how together we approached the City of Hobbs, discussing their needs and vision. During the whole project we were in constant contact with the operators and the principal users of the system. The result was an incredibly robust, secure and a system that will be in place for 30 years,” says Jeff Ballard, Siemens Automation Specialist.

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