metering assistance

Metal magmeter system helps a municipal water company evaluate daily demands

By Martin Neil

The city of Cordoba, Spain, has a population of 325,000 and like many cities, has experienced rapid growth. In 1970, the Municipal Corporation of Water Supply (EMACSA) was established to provide a reliable water supply to meet the city's growing demands. EMACSA was charged with the responsibility for conservation, installations and distribution network maintenance, plus water rates and tax collections necessary for the supply of freshwater. In addition, EMACSA was responsible for treatment of the city's wastewater.

Signifying its commitment to achieving a high level of water quality, EMACSA set up a quality management system based on the ISO 9000 standard in 1999. In 2004, it strengthened that commitment by implementing an environmental management system based on the ISO 14001 standard.

The majority of Cordoba's drinking water is piped from the Guadalmellato dam, located on the Guadalquivir River about 23 km from the city. This is done through a water distribution system consisting of two supply lines. Under normal demand levels, the water for the city comes from a single supply line and is distributed through the city's piping network. The secondary supply line augments the regular line when necessary to meet increased supply demands.

Determining Demand & Distribution

To better evaluate the daily water demands of the city and increase overall water distribution efficiency, EMACSA sought out a means by which it could obtain accurate monitoring and reporting of pressure changes, flow direction changes and water usage. GF Piping Systems in the U.S. teamed up with GF Piping Systems in Spain to work with the prime contractor, MAGTEL, to provide a system of electromagnetic flowmeters and other components that would meet these goals. The specific requirements for the system included the ability to detect and locate pipe leaks, monitor and report water usage in different city segments for assisting in future development plans and report total city water consumption.

Among the many challenges the project posed was installing the system into EMACSA's drastically varying pipe sizes, which ranged from 4 to 72 in. in diameter. GF Piping overcame this challenge by using the Signet 2551 and Signet 2552 metal magmeter electromagnetic insertion sensors, which adjust to fit pipe sizes from 2 to 102 in., easily accommodating EMACSA's requirements. A total of 123 magmeters were installed—70 Signet 2551 magmeters with 4-20 mA analog data outputs were used in the pipes from 4 to 12 in., and 53 Signet 3-2552 metal magmeters with 4-20 mA outputs were used in the pipes from 14 to 40 in.

Magmeter Solutions

The Signet magmeters provide high accuracy across a wide dynamic flow range of 0.15 to 33 ft/s (0.05 to 10 m/s), with repeatability of ±0.5% of reading. They are designed with no moving parts to wear or foul, minimizing maintenance and associated costs. Available with three output options of frequency, S3L digital data or 4-20mA, the customer had the flexibility to connect with a variety of instruments.

The sensors offer both empty pipe detection and bidirectional flow capabilities. An empty pipe is detected by sensing when the electrodes are not completely wetted and indicates the condition with a zero-flow signal output. This feature eliminates the need to perform special plumbing to keep the sensor wet at all times or the need to repipe or remount the sensor in another location when fluid is emptied from the pipe.

Each magmeter was installed alongside a pressure sensor to achieve a complete water flow profile. The data from each sensor is transmitted via a radio telemetry system to a control station several miles away, where PLC systems keep records of all activity and immediately detect any unusual water movement.

Top left: For the larger pipe, the Signet 3-2552 Magmeter adjusted to fit sizes 14 to 40 in.
Bottom right: Visual site inspection of the Signet 3-2551 Magmeter.

This information provides an accurate report of any pressure changes, the direction of the water flow, the amount of water being used and the stability of the entire system.

Integral to achieving this report was the utilization of the Signet 3-0250 USB to Digital (S3L) Configuration/Diagnostic Tool. This tool provides engineers with a visual water profile by converting the flow information from the 2551 and 2552 magmeters into a graph that can be displayed on a laptop computer, giving instant feedback on the pipe flow. At key locations in the water system, the 3-0250 Tool was used to scale the 4-20 mA output signal to enable the detection of a change in flow direction. It also allowed EMACSA to tailor the direct output from each measurement site to accommodate local conditions. This was a critical factor in fine-tuning the calibration as needed for both magmeters following installation into EMACSA's custom fittings. The 3-0250 diagnostic tool's monitoring function uses average and sensitivity functions to compensate for any unstable flow conditions.

A local indicator shows the water flow rate in m^3/hr. Water is expected to change direction as the level decreases during low-demand hours. The 2551 and 2552 magmeters can detect and monitor these changes accurately. Information is transmitted via a radio telemetry system to a control station several miles away, where a PLC system keeps records of all activity and can immediately detect any unusual water activity.

Project Outcome

"The entire installation was completed with all site calibration within just two days," said Javier Gala, telecommunications engineer for MAGTEL. "The system resulted in significant and immediate cost savings due to accurate reporting and decreased labor from more manual-intensive methods of analysis. The results have provided EMACSA with the valuable information they need for improved data collection and more efficient supply coordination." WWD

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