

McCrometer's FPI-X Mag Flow Meter Solves Tough Application Challenge for the City of Cedar Rapids



Figure 1: City of Cedar Rapids Water Treatment System

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Overview

After more than 24 months of analysis, the Water Division operations and maintenance team at the City of Cedar Rapids, IA, reports that McCrometer's FPI-X™ Mag flow meters have greatly improved accuracy and nearly eliminated maintenance problems experienced with strap-on ultrasonic flow meters at its booster stations. Water plant instrument technicians first installed the new FPI-X Mag meters in January 2012 and have now monitored them for nearly two years.

Brian Jess, an Instrument Technician from the City of Cedar Rapids Water Division, said, "We spent some time looking closely at various flow meters, and the FPI-X Mag track record is outstanding as compared to previous meters. The FPI-X Mag is reliable for operations staff, its maintenance is next to

nil, it's easy to take out if needed...overall, you could say I'm ecstatic with the product."

Plant operations and instrument technicians determined in 2011 that they needed to replace under-performing flow meters in two booster stations as well as in their water intake system. Their existing flow meters were strap-on ultrasonic transit-time meters. They were susceptible to electrical and radio frequency interference from electrical equipment in the station, such as the pumps' variable frequency drives.

The City of Cedar Rapids Water Division treats and distributes ground water from alluvial wells. (Fig 1). The Water Division has over 50,000 metered accounts, including residential, commercial and industrial, and serves a population base of around 128,000 people.

The Problem

The City of Cedar Rapids water distribution system includes two booster stations: The J Avenue NE Booster Station has eight vertical turbine pumps. The Bowling Booster Station SW operates with three horizontal split case centrifugal pumps. Accurate water flow measurement at the booster stations is critical to maintaining the system water supply and service to its customers.

The clamp-on ultrasonic flow meters in service at the two booster stations were not only underperforming and susceptible to electrical and radio frequency interference, they were also maintenance intensive. Their ultrasonic transducers required frequent cleaning and re-greasing to maintain measurement accuracy at an acceptable level.

When the city's water division team began the process of selecting a new type of meter, they knew water quality also played a role in their decision-making. The plant technicians were aware that condensation and exterior pipe wall rust could contribute to transducer maintenance if they opted for new ultrasonic flow meters.

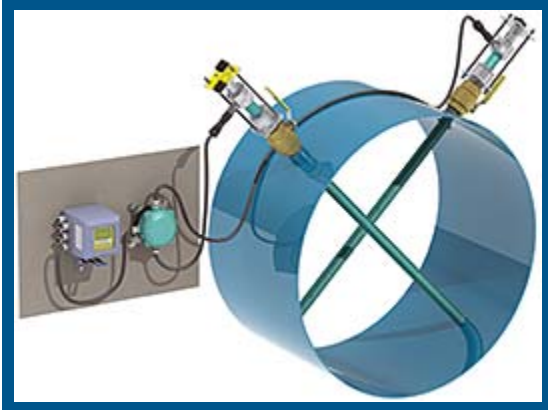


Figure 2: FPI-X Mag Flow Meter

In addition, the team was constrained by an application with little straight run pipe and an irregular flow profile. Many flow meter sensing technologies require multiple lengths of straight pipe to produce a stable flow profile in order to provide accurate measurement. Full bore meters also were not a feasible option due to space limitations.

Measuring flow in booster stations such as those found in the City of Cedar Rapids is both important and difficult. Accurate flow measurement at booster stations can impact both the supply and delivery of water. Challenges can include managing multiple pumps and a variety of line sizes, dealing with interference issues and retrofitting existing piping configurations.

The Solution

The City of Cedar Rapids Water Division contacted the applications team at McCrometer for analysis of its flow measurement needs. The company's applications team reviewed the situation in Cedar Rapids and recommended the FPI-X Mag flow meters with dual sensor assemblies (Fig 2).

The FPI-X product configuration is the newest line extension of the successful FPI Mag® product line from McCrometer. As Greg Webster, Sr. Applications Specialist at McCrometer describes, "Our traditional FPI Mag has been on the market for about 3 years now and is seeing wide acceptance in municipal and industrial markets. For the bulk of the applications we see, our FPI Mag is the perfect fit. However, there are specific applications where the FPI-X configuration is best. McCrometer developed the FPI-X to accurately measure flow from multiple pumps in series and can measure flow where almost no other technology can."



Figure 3: FPI-X FM Installed At SW Bowling Booster Station

Analysis under simulated flow conditions at McCrometer's Flow Lab determined that the FPI-X Mag meter's dual sensor assembly provided the best solution to handle the challenging flow variances at the booster stations. In addition, the FPI-X Mag meter's insertion-style design allowed for easy installation within the city's tight space requirements. The meter's unique design features two insertion-style multi-point sensor assemblies oriented at 90 degrees from each other in an "X" configuration. The advantage of the dual sensor "X" configuration is that it averages over the complete 2-dimensional cross section of the pipe, resulting in the FPI-X being less sensitive to major upstream flow disturbances such as the swirling and turbulent flow generated by pumps.

Tariq Baloch, Water Utility Plant Manager for the City of Cedar Rapids Water Division, has been impressed with McCrometer's level of field and factory support while making the purchase and throughout product ownership. "The support received was exemplary, and we've worked with a lot of different vendors," Tariq said. McCrometer's FPI Mag meter also stood out to the city's team because of its economical product cost, low total installation cost, low overall cost of ownership and high accuracy. Its multi-point electromagnetic flow sensing design provides accurate measurement under turbulent flow conditions and high repeatability in the

city's demanding water quality environments.

Bill Connolly, another city Instrument Technician, says, "The FPI-X Mag is between maintenance free and maintenance friendly. We don't get any of the interference that occurs with ultrasonic models. The FPI-X Mag is easy to set up and very accurate. "



Figure 4: FPI-X FM Installed At NE J Avenue Booster Station

Cedar Rapids' new FPI-X Mag dual sensor assembly units have been operational for over 24 months at both of the city's booster station sites. One FPI-X Mag meter was installed on the single 30-inch line at the SW Bowling Booster Station to measure accurately the flow from its three centrifugal pumps (Fig 3). Two FPI-X Mag meters were needed at the NE J Avenue Booster Station, each measuring the total output of four vertical turbine pumps on two 24-inch lines (Fig 4).

Webster also notes, "The FPI-X configuration is well suited for exactly the types of applications found in Cedar Rapids. The FPI-X Mag performs well in situations where you have multiple pumps and pipes coming into a common header. You get all the benefits of our traditional FPI Mag: easy installation, low total installed cost and high accuracy. In addition, the FPI-X configuration allows the sensor to measure in particularly tough flow profiles. Rather than place a meter on every individual pump, the FPI-X Mag allows you to measure in one location, while still measuring the overall output of multiple pumps."

The FPI-X Mag meters at the booster stations provide operational information through a supervisory control and data acquisition (SCADA) system so plant staff can maintain suitable flow rates to fill water storage towers and maintain totalized flow records from each station. The flow meters also provide up-to-date information on the condition of the distribution system in the affected pressure districts.

Featuring a next-generation mag meter design unlike anything else on the market, McCrometer's FPI-X Mag flow meter takes accuracy and ease-of-use to a new level. With its precision multi-point flow sensing technology and efficient hot tap installation method, which eliminates the need for extra labor, heavy equipment, or line shut down, this innovative mag meter delivers superior performance, convenience and total installation cost savings of up to 45 percent.

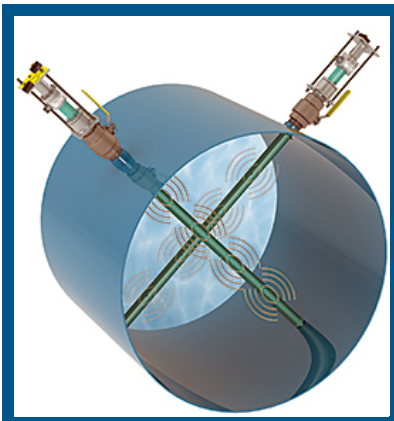


Figure 5: FPI-X Electromagnetic Fields

Unlike any other insertion mag meter which only measures at a single point, the FPI-X Mag meter's advanced multi-electrode sensor compensates for swirl or turbulent flow profiles (Fig 5). The electrodes, which are placed across the entire sensor body, continuously measure and report the average flow rate across the full diameter of the pipe, delivering accuracy comparable to the performance of a full-bore mag meter.

The FPI-X Mag flow meter's signal converter features an advanced filtering algorithm to support accuracy of $\pm 0.5\%$ from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) and of $\pm 1\%$ from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s) of reading. Built-in dual 4-20 mA outputs offer communication flexibility and additional programmable outputs serve to support the plant's SCADA system.

Conclusion

The City of Cedar Rapids is pleased with the performance of the FPI-X Mag flow meters. In contrast to its clamp-on ultrasonic meter predecessors, after 24 months of service the FPI-X Mag meters remain trouble-free. Following years of constant maintenance visits to service the ultrasonic meters, Bill Connolly laughs that, "The mice have returned to the pump stations." ■

