

CASE STUDY

FPI Mag Meter Improves City of Geneva Water Operations Management

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The City of Geneva, Ohio, resides in Ashtabula County, east of Cleveland, along Lake Erie. Founded in 1816, this picturesque city is now home to 7,000 residents. The City of Geneva Water Works Department is responsible for managing the city's 350,000 gallons per day drinking water operation.

The City of Geneva's water distribution system has a unique history and structure. Ashtabula County bought its water system from a private utility in 2003, which includes booster stations and storage facilities, but no treatment plants. The county purchases finished water from the private utility's treatment plant. The City of Geneva bought its water system in 2004, which is a distribution network connected within the county system. This system had no bulk metering to measure the city's actual consumption. The city has been billed by Ashtabula County according to an agreed formula that apportions an amount of the overall county consumption to the city.

The Challenge

Geneva's Water Works Department determined that eight individual metering locations were needed around the city. The City management had several primary considerations when selecting a metering solution.

Budget Impact. As a smaller municipality, Geneva has a limited budget. This compels smart investment in affordable, operational efficiency improvements. Securing the operational efficiency gains would depend on finding a very cost effective solution. Most of the city's water mains are in the road or right-of-way. An installation solution that could support the weight of vehicles was required since re-routing pipelines away from traffic was financially infeasible.

Ease of Installation – Minimal Disruption. Geneva needed flow meters that could be installed without the need for a line shutdown. Each of the metering sites is a connection to a county distribution artery that serves both the city and county consumers on the opposite side of the city. Shutting down these lines for a meter installation was not acceptable.

Meter Performance and Bi-Directional Capability. To meet Geneva's cost savings goal, a minimum of 1% accuracy was required. Additionally, the open nature of the distribution system allowed for water to flow in either direction in the pipelines. Therefore, a bi-directional metering capability was needed.

Start-up and Calibration Assistance. Since the city's distribution system had no bulk water metering, the nominal flow rates within the pipes were unknown. They needed a partner on this project that would help them establish initial flow rates and calibration ranges.

Aesthetics of Solution. The City of Geneva needed to find a metering solution that maximized siting options. As a scenic, residential community, Geneva had to find locations for above ground meter reading stations that were close to primary electrical service but would not compromise the aesthetic appeal of its properties .

The Solution

The Water Works Department reviewed a number of technology options, ultimately deciding that an electromagnetic flow meter would provide the accuracy and reliability needed. Different electromagnetic technologies were considered. They concluded the McCrometer FPI Mag was the only solution that addressed all their unique challenges.

Budget Impact. Spool type electromagnetic meters would require large vaults that would have to be installed away from traffic because these vaults could not support vehicle loading. Re-routing water lines would greatly increase the cost and implementation time. The FPI Mag flow meter's compact insertion design is particularly cost-effective for retrofit applications. Geneva used small manholes with 'dog house' cutouts. These manholes are fitted with metal covers designed to support the load of residential traffic. This installation technique avoided the expense and time of re-routing pipelines away from traffic.

The FPI Mag flow meter can also be removed from pressurized pipes for easy inspection, cleaning, calibrating or verification without an expensive shutdown and re-start sequence, thereby minimizing the cost of ownership.

Ease of Installation - Minimal Disruption. McCrometer's FPI Mag Flow Meter was an ideal solution for the City of Geneva's ongoing operational requirements.

Installation can occur without interrupting service, dewatering lines, cutting pipe or welding flanges. Geneva spent approximately five days installing each of the 8 meters in lines ranging from 6" to 16". This included four days to install the manholes and also electrical service to the new, above ground meter reading stations. Installation of the FPI Mag full profile sensor and electronic converter only took a combined half day, including the pulling of wiring from the sensor to the converter at the meter reading station.

Meter Performance and Bi-Directional Capability. Accuracy was critical to meeting Geneva's primary objective. The FPI Mag delivered on their accuracy requirements, with performance unmatched by other insertion mag meters. The FPI Mag Flow Meter's unique streamlined sensor features multiple electrodes across the entire pipe diameter.

This full flow profile measurement enables a very accurate, average flow rate calculation. Its highly stable profile provides accuracy of $\pm .5\%$ of reading, from 1 to 32 ft/sec velocity range, which rivals the performance of full-bore mag meters at a much lower total cost.

Additionally, the availability of the bi-directional model also fit the city's needs, allowing them to account for water regardless of the flow direction in their distribution system.

Start-up and Calibration Assistance. Due to the absence of bulk metering, Geneva was unable to provide McCrometer confident flow ranges for the factory calibration. Consequently, McCrometer used its NIST certified, full flow test facility to calibrate the units to a reasonable maximum flow velocity for each pipe size down to a minimum velocity reflecting very low flows. Once the meters were installed, Geneva and McCrometer worked together to confirm the calibration in the field using hydrant flows and individual consumer readings collected over a span of time.

Aesthetics of Solution. With the FPI Mag meters requiring such little installation space, Geneva gained multiple siting options that were aesthetically satisfying.

Results

The Geneva Water Works Department concluded McCrometer's FPI Mag full profile insertion flow meters met their accuracy, reliability and bi-directional requirements with an installation approach that satisfied their cost, siting and uninterrupted operation needs. All eight McCrometer FPI Mag flow meters were installed in aesthetically pleasing locations, in minimal time, with minimum investment and with no operational interruptions. They

are all currently performing successfully, and in short order the city's goal of transitioning to an actual metered billing basis will be realized. Geneva anticipates operational cost savings of 8%-12% per year as a direct result of their investment in the McCrometer FPI Mag flow metering system.

As David Corbin, McCrometer Product Manager, said, "The application for the City of Geneva benefited from several differentiators that the FPI Mag delivers. Any one of these benefits--total installed cost, ease-of-installation or accuracy--can separate the FPI Mag from other meter options. In the case of Geneva, they were able to realize several of these benefits all at once."

FPI Mag Technology

All magnetic flow meters, including the FPI Mag, operate under the principle of Faraday's Law of Electromagnetic Induction to measure water velocity. The principle of operation states that a conductor, such as water, moving through a magnetic field, produces a voltage which is directly proportional to the velocity of the water moving through the field.

The FPI Mag's multi-electrode sensing provides accurate measurement without long upstream and downstream straight pipe runs. The multi-electrode sensor design compensates for variable flow profiles, including swirl, turbulence and low-flow conditions. Multiple electrodes placed across the entire sensor body continuously measure and report the average flow rate over the full pipe diameter for greater accuracy and repeatability.

The FPI Mag flow meter is packaged in a heavy-duty 316 stainless steel sensor body for maximum structural integrity. The sensor is coated with a NSF certified 3M fusion-bonded epoxy coating for operational longevity. With no moving parts and a single-piece design, the FPI Mag flow meter contains nothing to wear or break and it is generally immune to clogging by grit or other debris. The flow sensor comes pre-calibrated from McCrometer's NIST traceable Calibration Lab and requires no recalibration in the field.

Choosing the flow meter best suited for an application will result in improved accuracy, repeatability, lowered maintenance costs and will promote a long-life for the flow meter. Its superior value in terms of the cost of installation and the low cost of ownership make the FPI Mag an excellent flow measurement choice for municipal water facilities.