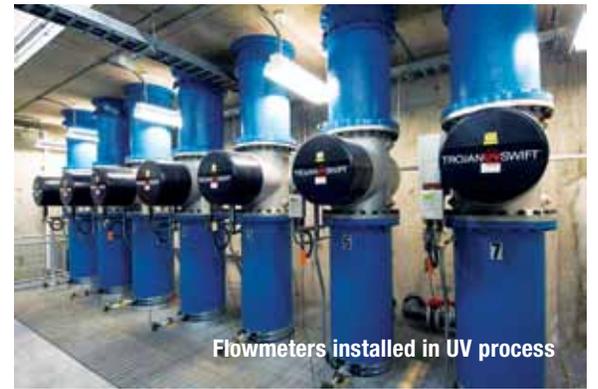


Clean Water for Seattle



By Pam Fuller

Effective flow measurement critical to water treatment facility

Seattle Public Utilities has a reputation for providing high-quality water to its customers. The tradition continues with the state-of-the-art Cedar Water Treatment Facility (CWTF), located southeast of Seattle at the Lake Youngs Reservation. Designed, built and operated by CH2M Hill, the award winning facility is a model for sustainable environmental design.

The CWTF facility provides 70% of the Seattle metropolitan area's drinking water and can treat up to 180 million gal (mgd) of water per day. The treatment operation relies on both time-tested and innovative technology that includes watershed protection and chlorination, as well as advanced ozonation and ultraviolet (UV) disinfection.

Accurate flow measurement is essential to the safe, efficient operation of the CWTF facility. Flowmeters are installed on the raw water intake system that pumps water from the lake, in the various water treatment areas and at the point of distribution to the municipal water system.

The CWTF was originally built in 2002 and became operational in 2004. During construction, CH2M Hill selected a fiberglass electromagnetic insertion-style flowmeter to support its UV disinfection system. The meter was chosen for its ease of installation, small profile, low maintenance and cost-saving features. This fiberglass mag meter became a part of McCrometer's flow product line when the manufacturer was purchased several years later.

CH2M Hill's subsequent experience with McCrometer demonstrates how operators and suppliers working together with evolving technologies can achieve advances that benefit the entire water industry. In this particular case, coordination and communication between CH2M Hill and McCrometer impacted the redesign of the FPI Mag flowmeter.

"The original fiberglass meters weren't installed as the primary plant flowmeters, but given the more favorable hydraulic conditions in the UV reactor pipelines, they turned out to be the most accurate in the facility," said John Wesely, CH2M Hill's CWTF operations manager. "When we decided to install the redesigned flowmeters, we planned to use them as the primary meters to measure treated water for compliance purposes and to determine chemical and power efficiencies.

"We combine the flow of the 13 FPI Mag meters on the UV disinfection lines to calculate total treated plant flow each day. While we have flowmeters in other locations that were intended to measure totalized plant flow, our experience has shown the FPI Mag meters provide accurate and reliable measurement of plant totalized flow each day."

CWTF Treatment Process

Lake Youngs serves as the treatment facility's supply reservoir for water from the 90,500-acre Cedar River watershed. While designing the treatment facility, CH2M Hill strived for the least environmental impact on the site.

The facility features a complex ozone/UV treatment process that serves to disinfect the water as well as improve taste and odor. Liquid oxygen is transformed into gas, and a portion of the oxygen is converted to ozone. The ozone is transferred to the water by diffusing the gas into the flow within concrete injection chambers.

After completing the ozonation process, the water undergoes UV treatment for disinfection using a TrojanUVSwift system. The facility's 57-kW UV reactors are set on 13 vertical 24-in. lines. A flowmeter is installed on each line to measure the liquid flow rate and totalized flow output. Facility managers monitor this important data to ensure operational goals are met each day.

Importance of Flowmeter Accuracy

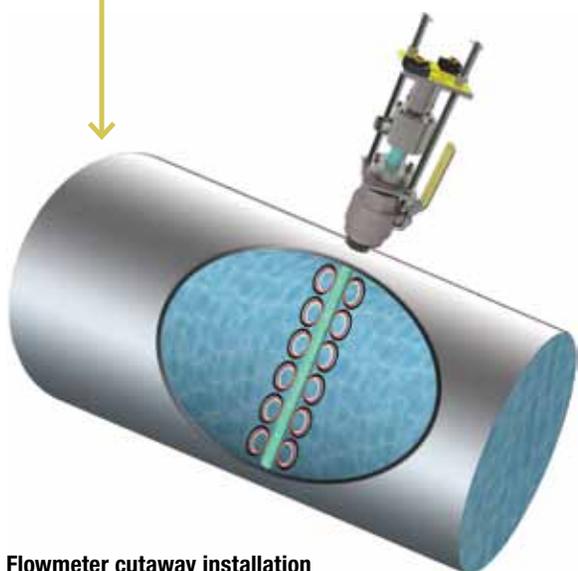
Flow measurement accuracy in the UV treatment process was essential in meeting the facility's operational requirements. Several years after the original meters were installed, McCrometer redesigned the product to improve its performance, particularly in harsh municipal applications.

"The UV disinfection application process presented a particular challenge for the prior design," said Nick Voss, McCrometer product manager. "We knew we could partner with CWTF and CH2M Hill to solve some short-term challenges, as well as coordinate on the next-generation design. The new design is a great example of cross-functional new product development. We took the original product and combined it with both real-world feedback and McCrometer's history of developing durable flowmeters."

As a result, the new flowmeter was designed with a heavy-duty 316 stainless steel sensor body for maximum structural integrity. With no moving parts and a single-piece design, it contains nothing to wear or break and it generally is immune to clogging by grit or other debris. The sensor's body is hermetically sealed and protected by an NSF-certified 3M fusion-bonded epoxy coating.

The sensor features multiple electrodes across the entire pipe diameter. This full-flow profile design enables accurate measurement by averaging the flow rate calculation over multiple points within the pipe.

The flowmeter's stable flow profile provides accuracy of $\pm 0.5\%$ of reading, from 1- to 32-ft-per-second velocity range, which rivals the performance of full bore mag meters at a much lower total cost. The flow sensor comes pre-calibrated from



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"McCrometer stood behind the product and invested in R&D to make improvements," Wesley said. "They also provided all the technical support and customer assistance to replace and reinstall the second-generation mag meters at our facility."

Ease of Maintenance

Wesley said minimal maintenance is required for the flowmeter. "We periodically test the accuracy of the meters by closing the discharge valve on one of our clear wells and comparing the increase in water level over time with the measured totalized flow of the mag meters. The meters can be easily pulled out in 10 minutes for any reason." ^{WWD}



The state-of-the-art Cedar Water Treatment Facility is located southeast of Seattle at the Lake Youngs Reservation.

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