Flowmeter *Versatility*

Hybrid ultrasonic flowmeters support a Key West treatment plant's performance

By Gary Rose

A hybrid ultrasonic flowmeter was selected because of its remote access communications capabilities.

The Florida Keys have long been known for exotic islands, pristine snorkeling, artistic charm and a magnificent coral reef. Maintaining the quality of the seawater surrounding the Keys is essential to the allure and economic viability of the area.

Key West, Fla.'s, southernmost wastewater treatment plant was constructed in 1989, designed and permitted to produce secondary effluent at a rate of 10 million gal per day. Prior to this, raw wastewater was discharged directly to the ocean outfall. In fact, it was one of the last raw wastewater discharges to the ocean in the U.S. The plant was expected to remove pollutants from wastewater and reduce nutrient levels to 20 mg/L of total nitrogen and 6 mg/L of total phosphorus.

In recent years, Key West has implemented aggressive measures to reduce nutrient levels to meet or exceed the standards set by the Federal Department of Environmental Protection for advanced wastewater treatment plants. The city has spent more than $67 million over the past five years on sewer capital improvements to rebuild the collection system, replace the ocean outfall with two Class 1 Deep Injection Wells and upgrade the current sewer treatment plant to an advanced wastewater treatment facility.

The Key West wastewater collection system operations and maintenance are contracted out to CH2M HILL, Operations Management Intl. (OMI). As part of the ongoing effort to maintain the high-quality standards of the facility, OMI decided that it needed a reliable, versatile, nonintrusive flowmeter that could measure both rate and total of either dirty water or clean water.

OMI had experienced numerous failures with ultrasonic (Doppler-only) flowmeters in the past, but it was willing to try a hybrid ultrasonic due to the flexibility of using the tool in various applications. OMI's first area of measurement concern was at each of the five main stations, where knowing the rate and the total of the wastewater is crucial in maintaining an efficient facility that encompasses 26 substations.

Flowmeter Selection

OMI selected the Blue-White hybrid ultrasonic flowmeter Sonic-Pro primarily because of the flexibility and communications capability of remote access. The Blue-White Sonic-Pro Series hybrid ultrasonic meters can measure any acoustically conductive fluid in any pipe material above 2 in.

The term "hybrid" refers to the ability to select either Doppler mode or transit time mode. In order for the Doppler mode to be effective, the fluid must contain 0.02% to 15% (200 to 150,000 ppm) of particles. Conversely, the effectiveness of the transit time mode requires relatively clean fluid, containing 0% to 10% (0 to 100,000 ppm) of particles. Additional characteristics of the Sonic-Pro include:

- A NEMA 4X (IP66) powder-coated aluminum enclosure;
- A UV-resistant 320-by-240-pixel QVGA backlit LCD display;
- A five-button position action tactile switch keypad; and
- A date/time-stamped flow rate/total data in FAT32 file format that is easily imported into Excel.

The data outputs include a

4-20 mA and 0- to 1,000-Hz pulse. Further options encompass process control (three independently configurable 10-amp Form c, NO/NC relays) and external communications (computer connection via RS-232, RS-485, USB, Ethernet).

Installation & Performance

Initially, the flowmeter was manually configured on site by inputting several key data figures, (e.g., pipe material, pipe outside diameter, pipe thickness and speed of sound). Once the configuration was completed, it was saved within the signal processing unit (SPU). If the meter was set in transit time mode, the SPU would have displayed the appropriate transducer spacing. In this particular application, the meter was set in Doppler mode for wastewater.

The pipe material was PVC pipe with an outside diameter of 15.32, a wall thickness of 0.82 and a 1,505 m/second speed of sound in water. The transducers were mounted directly opposite one another on the side wall of the pipe—normal for a Doppler reading.

Upon setup completion, the configuration was manually activated, triggering the flowmeter to enter run mode. The flow and total rates were immediately displayed, reflecting the accurate measurement of wastewater being pumped. The accuracy of the Sonic-Pro in Doppler mode is ±2% of rate at a flow rate greater than 12 ft/second.

Reaction & Recognition

CH2M HILL was pleased at how easily the installation proceeded and impressed with the capability of the meter to remotely access and upload data logging files via the external communications. Due to this success, CH2M HILL-OMI has plans to further implement the Sonic-Pro at the other substations.

At a recent Florida Water Resource conference, the Florida Water Environment Assn. awarded the city of Key West wastewater collection system with four top honors. These awards included first place in the Advanced Secondary Treatment category. WWD

Gary Rose is president of Rose Industrial Marketing. Rose can be reached at 800.975.5469 or by e-mail at gcr@roseIndmktg.com.

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