As seen in the October 2010 issue of
PipeLineandGas TECHNOLOGY

On the hunt: A gas utility's search for accuracy

With some 30,000 consumers depending on reliable service, Southeast Alabama Gas District needed highly accurate meters and a plugged-in SCADA system.

Richard DeAngelo, *Sensus Product Manager*

In real estate, the mantra is location, location, location. For the staff at Southeast Alabama Gas District (SEAGD), it's accuracy, accuracy, accuracy.

In the morning hours of a sunny Alabama day, Neil Arrington, computer support specialist at SEAGD, settles at his desk with coffee, his eyes drawn to the SCADA system that monitors the 800 miles of transmission line and 1,400 miles of distribution line that make up the 55-year-old utility's network. He, along with members of the company's gas control center, is watching. He's listening. He's one of the gatekeepers.

The Andalusia, Alabama-based company was formed by 14 member cities and has a customer base of 30,000, comprised of some 26,000 residential and 4,000 commercial and industrial (C&I) accounts, including manufacturers and processors, hospitals, schools, hotels, apartment buildings and small businesses.

SEAGD acquires gas from a variety of sources, including two intakes from El Paso Energy Corp. and two from Florida Gas Transmission Co. In addition, two companies inject gas directly from production fields.

Due to the variety of energy sources and the physical location of a large industrial customer, inherent gas flow conditions resulted in operational issues for the turbine meters that measured consumption. This situation created challenges as SEAGD tried to balance gas coming onto the

By integrating auto-adjust turbo-meters with its SCADA system, Southeast Alabama Gas District benefits from accurate measurement and instant alerts to changes in its system.

system with gas being delivered to customers.

"With the volume of gas we bring through the meters, it's critical for us that we know that the accuracy is there and it's critical that we know there's a problem before that problem develops," explains Arrington.

The challenge

The problem, in this case, involved staying on top of meter accuracy and meter operations. SEAGD employs a third party to validate accuracy every six months on intake and industrial meters. But the district was unable to continuously monitor critical high-flow meters.

Royce Sightler, the utility's director of operations for both its central and western divisions, began looking for a solution.

"The most important issue we were facing was twofold. It was the accuracy of the meter reading and also the ability to validate it at any point in time. Many times, the meters were out of adjustment due to bearings slowing up or something just not being right. So we set out to find an alternative solution," he says.

To help correct the problem, SEAGD turned to Sensus, a Raleigh, North Carolina-based provider of metering infrastructure, distribution automation and smart grid technology, and its distributor partner, Equipment Controls Co. (ECCO).

Within its territory, SEAGD delivers high volumes of gas each month to C&I customers, including a three-unit power plant, paper mills and a variety of processing plants. With up to 2 billion cubic feet of gas flowing through its intake each month, accuracy and reliability are paramount. Demand can ramp up at any time of the day or night. SEAGD's gas control department provides continuous coverage of the distribution network by monitoring gas flow and pressure.

"We approached ECCO and Sensus and told them our flow rates and pressures and what was happening with our readings, and they recommended a solution for us," says Sightler.

The installation

To ensure a complete view of the system, auto-adjust turbo-meters (AATs) from Sensus were installed and integrated into the company's SCADA system via serial communications with each meter's Mercury Instrument turbo corrector.

"Our company took the extra step to incorporate everything into our SCADA system," says Sightler, "and that really made a difference."

The turbo corrector reports information from the meter through a remote

terminal unit (RTU) and then directly to the SCADA system. With continuous monitoring, SEAGD can view the meter's performance and be alerted to changes via preprogrammed alarms.

Today, the utility not only has a meter solution that automatically adjusts for changes experienced in the pipeline, but it also alerts operations personnel to conditions of which they need to be aware—all while maintaining an accurate account of gas flow.

Turbine meters are not new to the gas utility industry; they've been the workhorses for decades. Standard turbine meters are built with a single-rotor design. The speed of flowing gas is measured by the rotation of the rotor as gas passes through. Since the flow of gas is directed through a fixed, cross-sectional area, the rotor speed, through a series of mechanical gears, is converted to the volume of gas that has flowed through the meter. Although they are accurate, they are susceptible to flow anomalies that can affect how the rotor spins.

The Sensus AAT is designed to continuously monitor accuracy and adjust for changes in gas-flow conditions, such as jetting, pulsation and swirl, as well as adjusting for meter drag caused by component wear and contamination. The meter utilizes dual rotors, a main and a sensing rotor, to monitor and measure consumption. As gas flow passes through the main rotor, it exits the rotor blade at a specific angle.

This exit angle, which is consistent, is measured by the independently mounted sensing rotor. The speed of both rotors is fed via high-resolution pulse generators into a turbo corrector, which uses proprietary algorithms to compare the ratio between the two rotors to accurately determine the volume of gas flowing through the meter.

Alarm signals

The alarm function, which helps monitor and adjust the network, is one of the more important features of the new metering system. Arrington has set alarms to the Delta A of each meter. Delta A is a self-checking output derived from the ratio between the main and sensing rotor pulses.

"On these Sensus meters, we have a turbo corrector from Mercury Instruments that is actually getting the pulses from the meter and it's getting the Delta A calculation," explains Arrington. "And then we've got a RTU which pulls pulses from the meter. It's pulling in that Delta A value through a live-feed digital circuit from the Sensus meter, through our RTU and into our SCADA.

"We have the alarms set up on the SCADA side. It's showing -.05% and then we've got an alarm set on, for example, 5 (+5 and -5). If that Delta A shoots way up, then we know there's something going on. But you do have to watch, because when these meters are just sitting there, with no gas flowing, then one of the power plants decides it's going to come online. When it comes on, there's a rush of flow, then we'll see a Delta A alarm pop up until the meter has time to adjust."

When the AAT meter is first installed, its performance is checked against the factory calibration by comparing field-installed Delta A values with the factory Delta A values. As the meter remains in service, it is rechecked against the original calibration value.

"We also have the actual, uncorrected measurement," he says. "At my desk, I can look at that uncorrected measurement and look at that Delta A anytime. I can look at my calibration sheet that came with the meter to see the deviation of the Delta A and compare it to any point in time and see that it's still within line, within spec. It just gives us more assurance that we know that it's running correctly."

When pipeline conditions create deviations in the meter's performance, the meter continues to monitor the volume of gas as it's transferred between the rotors, thus maintaining measurement accuracy. By having the AATs linked to the utility's SCADA system, gas-control operators can not only view current conditions, but they're also alerted to meter and pipeline conditions that require field support.

Successful hunt

The AAT meters receive monthly maintenance, which mostly equates to filling the automatic oilers. Other checks and scheduled service are performed at the same time. Although the meters provide continuous, documented performance information back to SEAGD, the company hired a third-party contractor to validate meter accuracy every six months for complete assurance and transparency with its high-volume C&I customers.

The hunt, it appears, has been successful, and the accuracy of the new meters has brought a sense of comfort to SEAGD and its customers.

"That's putting it mildly," says Sightler. "This has given us a sense of peace, because we didn't have it before but we do now. The way we have it set up, we're able to validate what the system is doing without having to worry in the back of our minds, is it accurate or not? We know it is based off of the instant data that we get."

When asked if neighboring utilities could learn something from the path that SEAGD has taken to achieve accuracy and peace of mind, Sightler doesn't hesitate.

"If another utility contacted us, we'd tell them that there might be something better out there, but we haven't found it. We're very pleased with the measurement of the meter, we're pleased with the dependability of the meter. We haven't had any issues, but what really gives us comfort is the way we got the SCADA set up so that we can look at it. It allows us the comfort of knowing that the meters are accurate at these volumes. And on large volumes, you can't afford to have problems." ■