Tricky Business:Maintainingand MeasuringSulfur FlowWithout Clogs

How do you handle such a problematic substance as molten sulfur? One company is finding success with ultrasonic flowmeters, enjoying a significant improvement in accuracy as well as a reduction in downtime

Just the Facts About Ultrasonic Flowmeters

Maintaining a steady flow of molten sulfur and measuring that flow are challenging enough. These tasks become even more difficult if the equipment used to measure the sulfur flow is clogging lines and causing downtime. Honeywell Corp. faced such a dilemma at its chemical processing facility in Hopewell, VA. At this plant, Honeywell processes raw mined sulfur and combines the processed sulfur with other chemicals to make Caprolactam, a nylon-6 fiber ingredient available in liquid or flake form. Caprolactam is used in the production of commercial and residential carpet, pharmaceutical and engineering plastics, and automobile plastics parts and housings. Because the Hopewell plant is the largest producer of Caprolactam in the world and produces more than 350,000 tons annually, it's crucial that sulfur flow be properly maintained and accurately measured. However, keeping the sulfur moving through the pipeline can be a tricky proposition. Viscous at lower temperatures and turning solid at higher temperatures, sulfur is a fickle substance that demands pipeline temperatures between 120&#176 and 140&#176C, constant line tracing, and accurate metering. For about 15 years, Honeywell had used orifice flowmeters to track and measure the sulfur flow. Rob Affalter, Honeywell's instrumentation reliability engineer, says these meters were not ideal. Not only were they lacking in terms of accuracy, start-up time, and overall response, they also featured a narrow (1/4 to 3/8 in.) orifice that caused rocks and gravel from the mined sulfur to plug the lines. This plugging led to erroneously high flow rate readings or often no readings at all.

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According to Affalter, all five of the orifice flowmeters required a good deal of maintenance, and each had to be replaced every four to six months. "When replacing the old flowmeters, we couldn't let the line go cold because it would be difficult to thaw out the sulfur and get it flowing again. Our guys had to change the meter while it was hot, which was a potentially hazardous task. Maintenance could also be tedious and unsafe as the workers would have to dig a little dipper into the orifice and remove the sulfur a little bit at a time by hand." Also, restarting the sulfur burner after the meters had been out of operation was not an easy task. "It actually took some time to get the burner back up," he says. "In fact, we would

sometimes have to drag out a portable gas burner cart and heat the units up to 500&#176C before they'd be able to burn on their own." An opportunity to change this situation came during the company's capital upgrade of the Hopewell facility. The upgrade included changing some of the facility's piping. Affalter decided to audition what he thought would be a more reliable flowmeter in conjunction with the new pipes. He selected an ultrasonic flowmeter from Krohne Inc. called the UFM 3030. The UFM 3030, which uses a three-beam design with digital signal processing to attain maximum accuracy, reliability, and repeatability, has been specifically designed for the measurement of liquid hydrocarbons, acid, caustic liquids, organic chemicals, and non-organic substances such as chlorine and sulfur. Perhaps the device's most important feature for Honeywell's sulfur metering application is its unobstructed flow path design with a one-inch bore opening, smooth surface finish, and no moving parts. This design feature means material buildup is prevented and maintenance is minimized.

"We currently are working with six of the Krohne ultrasonic flowmeters in our sulfur processing section," says Affalter. "And we've experienced dramatic improvements in accurately reading the flow and reducing downtime. We no longer have to pull the meters to clean or replace them &#151 that's obviously a huge advantage. We're also able to completely control the flow with the meter on automatic control. Prior to using new meters, too much flow could lead to blockages and too little flow could overheat sections of the system." Like a racecar that needs a long idle time before racing, Honeywell's old meters were exceedingly slow at start-up. In fact, the operations people would have to get the flow rate to about 30 percent before the meter would be able to begin reading it. "The UFM 3030's ability to read lower flow rates lets us ease up the control valve right at start-up, so we don't have to worry about excessive sulfur flow leading to problems downstream," explains Affalter. "The control valve itself is a major step up. In the past, we might have control valves sticking, and we couldn't easily diagnose the exact cause of a flow problem." Affalter believes it is the UFM 3030's repeatable performance &#151 not having to pull the flowmeters &#151 that has improved sulfur flow and processing at Honeywell. So far, the ultrasonic meters have required no calibration and minimal maintenance and oversight. "Our operations team has complete trust in the UFM 3030's ability to deliver non-stop operation and accurate results. We're better equipped to diagnose problems now because we know we're getting accurate readings time and time again." What other improvements might the facility see? Affalter says: "We actually have another sulfur flow application with which we are currently not using a flowmeter at all. We're burning sulfur to make sulfuric acid, and we're likely going to incorporate a Krohne ultrasonic flowmeter over there, too. I know that many of our people have been very impressed with the Krohne ultrasonic meters. We work with a lot of liquids that don't have a lot of conductivity, or have no conductivity, and we see this flowmeter as being a great solution for these types of chemicals." *Additional information about ultrasonic flowmeters is available from Krohne Inc., 7 Dearborn Rd., Peabody, MA 01960, by calling 978-535-6060, or visiting www.krohne.com. Krohne is a leader in the development and manufacture of measuring instruments for the process industries.*

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