

Measurement Analysis Field Test Leaves Operator In A Quandary

by Paul Ellis

When Sam Miller and Greg Hoffman left the SpectraSensors San Dimas (CA) factory, they had no idea that their moisture analyzer demonstration would upset the owner of the natural gas flow facility, jeopardize the business relationship between their field sales rep and the owner for other products, question the competency of two independent service techs, and involve three people from the owner's largest customer who could initiate an expensive shut-in.

The sales rep had arranged the demonstration to be part of the owner's regularly scheduled moisture measurement and report to the customer. Other than the hot Southern California sun, Miller and Hoffman expected the demo to follow an efficient routine, taking no more than five to six minutes: connect the regulator of the model SS2000 Analyzer with a pipefitting, cycle the unit, take a measurement, and summarize the benefits of a non-contact laser sensor.

Miller and Hoffman drove through a suburban neighborhood to a small walled-in concrete pad packed with regulators, membrane filters, flow meters, and odorizer. A chilled mirror scope measurement by the independent techs was nearing completion. Despite the close quarters, everyone was in good spirits, especially the owner who was pleased to hear the reading of between eight and 10 pounds, confirming an earlier measurement by his employees from the same tap.

The sales rep signaled Miller and Hoffman, who took about three minutes to connect the SS2000. Thirty seconds later, everyone leaned forward to see the LCD display, expecting a comparable 10 pounds or less moisture measurement.

The display registered 20 pounds — also representing the analyzer's top measurement limit.

Hoffman answered the look of alarm on the sales rep's face by requesting a time-out so that he could call the factory to review the situation with the vice president of engineering and ask a factory rep to pull an SS2000 out of inventory and drive it immediately to the site. Hoffman described the steps he and Miller had followed. They had downloaded the sample gas data into their laptop computer and had run a spectroscopic graph for error checking. The water peak on the graph's curve truncated at 20 pounds, indicating that the moisture content was

higher than displayed. The V.P. replied that the data appeared normal and that the analyzer seemed to be operating properly.

The sales rep stepped into the conversation and suggested that the SS2000 may in fact be accurate. Miller asked that the group break for lunch because the second analyzer would arrive in about 45 minutes. The owner agreed and ordered another chilled mirror measurement with an admonition to be especially diligent. He also called for an awning to provide some welcome shade.

When the group returned, the techs had analyzed the multiple frost spots on the chilled mirror and said that it matched the morning's measurement of eight to 10 pounds.

The second SS2000 arrived, and before taking a moisture measurement, the factory tech connected a desiccant dryer in line with the analyzer and it instantly dropped to zero. Although it appeared that both machines had provided accurate moisture measurements, the group remained unconvinced that they were analyzing 20+ pound wet gas.

The owner persevered, ordering a stain tube measurement, commenting that even if the tube's known error was about 20%, he reasoned that if it agreed with one or the other measurements, it would roughly corroborate one or the other and resolve the issue. Two stain tube measurements were 60 and 80 pounds respectively, eliminating the 20% error as a deciding factor.

Hoffman suggested one additional step, recalling that the owner's gas company customer had purchased two SS2000 Analyzers factory-set to a higher upper limit. He recommended that the owner invite them to measure his gas with their instruments. The owner agreed and three gas company techs came to the site with two 90-pound top-end machines and a chilled mirror instrument.

The gas company's machines measured 50 pounds!

On the chance that even their machines may have given inaccurate measurements, they carefully installed the chilled mirror. After about 30 minutes, it revealed 48 pounds. The owner now faced the possibility of a shut-in and back flushing four miles of wet gas, plus expensive pipeline maintenance costs. He considered an additional measurement with an electrochemical sensor he had in his truck but decided that he had enough evidence.

What happened next is beyond the scope

of this article. This example of a technology shootout under a hot Southern California sun is only one of many actual events as laser-based measurement technology replaces the half-century-old Bureau of Mines standard. According to SpectraSensors, even their customers find the transition difficult. Typical question: "Besides the display, how do I know the machine is working?"

Regarding the absence of consumables and rare calibration requirements, others comment with a little apprehension, "I never have to do anything to it." But once they understand the system, SpectraSensors says, most wonder why they had resisted the new technology.

It could be argued that a decision to change important measurement procedures requires trust. In the 1990s, JPL/NASA followed a rigorous decision path before choosing a predecessor of the SS2000 technology for the Mars Lander. Extensive research indicated that they could trust the laser-based system to withstand a 50-Gs rocket launch and the harsh environment of interplanetary space.

Similarly, following years of planning and product trials, the FAA recently certified, and the National Weather Service approved, another variant of the SS2000 technology that is now in service aboard United Parcel Service Boeing 757 aircraft. As the 757s crisscross the country at various altitudes, they measure atmospheric moisture and transmit real-time data every six seconds to a central weather forecasting facility. Now, UPS flights can avoid or go around dangerous weather patterns caused by volatile columns of rising moist air that until recently were a primary cause for delayed or canceled delivery service.

Given the natural gas industry's concern for pipeline safety, maintenance, and uninterrupted flow of tariff quality gas, the question is almost unavoidable. At what point does the chilled mirror standard give way to a faster, more accurate, and more reliable laser-based technology? *PE&GJ*

Note: The SpectraSensors players in this article were Sam Miller, P.E., Director of Marketing for Industrial Process Monitoring Products and Greg Hoffman, Director of Sales. Paul Ellis is a free lance writer who lives two miles from the Jet Propulsion Laboratory in La Canada, California.