

Non-Invasive Liquid Level Gauge Technology Advances

Widespread commercialization of gauges using non-invasive, non-intrusive technology to detect the liquid level in pressurized tanks is advancing, but at a deliberate pace. Among the firm's leading the research and development is Adept Science & Technologies LLC (ASCENT; Los Alamos, N.M.).

One of ASCENT's latest projects is a cooperative effort with San Antonio's VIA Metropolitan Transit (see *BPN*, July 2005, p. 34), whose fleet includes propane-fueled buses, streetcars, and vans. The undertaking involves field trials of ASCENT's proprietary Maximus stop-fill instrument for propane tanks. The Maximus is a sonic-based, non-invasive instrument that detects, from the outside of the tank, the liquid level as it reaches a prescribed mark.

Under such technology, sound waves are applied to the outside of a container. The sound propagates through the metal plate in the form of bending waves of a certain frequency. The waves slow down when the metal plate comes in contact with a liquid, and the change in the speed of sound indicates the level of liquid in the tank.

Ongoing development of the Maximus stop-fill instrument builds on research and testing undertaken by ASCENT with industry support that began in 2000. The company designed, assembled, and lab tested a prototype device, which was also field tested. Seventeen units were deployed to determine their effectiveness in detecting liquid level in stationary, horizontal tanks.

The desirability of such technology on the part of the industry is being driven by the economics of propane distribution, according to the Propane Education & Research Council (PERC). "Typically," PERC said, "inventory turnover through bulk storage comprises one of the least defined and most difficult parts of a propane marketer's inventory management cycle during high usage periods."

VIA's Story

VIA initially contacted the technology development and transfer company because it was in search of a means to comply with a Railroad Commission of Texas (RRC) "Liquefied Petroleum Gas Safety Rules" regulation on the books at the time, said Jared Meyer, ASCENT's vice president of engineering. The original regulation read, "Where an overfilling prevention device [OPD] is installed on an engine fuel container, venting of gas through a fixed maximum liquid level gauge shall *not* be required."

"Although this regulation was on the books, no known fleet operator complied with it since they reportedly could not rely on the OPD," Meyer said. In other words, the folks fueling VIA buses were still relying on the spitter valve because of documented OPD accuracy and performance failures.

In addition to the RRC compliance issue, VIA officials sought from ASCENT a dependable stop-fill device in order to reduce product losses and achieve emissions reductions by forgoing use of the outage valve, thereby saving the transit authority money, promoting occupational safety, and achieving health benefits.

ASCENT's efforts to provide an integrated dispenser shut-off system using its sonic technology was complicated soon after work began last year, Meyer said, when a revision to



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RRC's safety rules took effect last September. The expanded regulation requires propane vehicle owners to verify OPD reliability and accuracy if fueling operations entail no venting. Verification of performance must be documented annually, and compliance must be clearly marked on the tank. Also, the OPD must be replaced every two years, a requirement that also must be documented by the vehicle owner.

To address the modified RRC rules, the scope of

ASCENT's work changed to now include permanently installing two sonic sensors on the outside of bus tanks instead of one. One sensor is located above the 80% fill line (85% full), while the second is below the 80% line (75% full). After each fill, the lower sensor registers the liquid fill, while the upper sensor reads the percentage of the tank with no fill, if the OPD is operational.

"This work will ensure that at each refill, the VIA refilling technician will have the certainty that the mechanical OPD worked properly," Meyer said. "If the technician does not get the proper signal after filling, the bus can be tagged and the appropriate actions can be taken to remedy the situation."

ASCENT's project at VIA includes installation of sensors and the necessary connector boxes on 20 buses. VIA will also receive six Maximus instruments that can be handheld, attached to the dispenser, or hung from the filling station ceiling.

ASCENT will develop and commercialize a stop-fill instrument following the conclusion of testing at VIA, one of the desired results from the project expressed by the propane industry.

—John Needham