Back to Basics in UST Leak Detection

by Wolf H. Koch, PhD

TWO RECENT ARTICLES IN PE&T ONLINE, "Non-Stop SIR Detects Leaks and Monitors Meter Accuracy" by Warren Rogers (April 2001) and "Release Detection Requirements for High Throughput Underground Storage Tanks" by Dean Cheramie (August 2001) have prompted these reflections on the use of automatic tank gauges (ATGs) in underground storage tanks (USTs).

Release Detection History

Dean Cheramie's article provides a brief history of release detection requirements as published by EPA in September 1988 in 40CFR, Part 280: Underground Storage Tanks; Technical Requirements. In addition to EPA, other organizations started developing an interest in release prevention and detection. For instance, in the late 80s a number of insurance companies sponsored the formation of a committee under the auspices of the American Society for Testing and Materials (ASTM) with the express purpose to develop Emergency Standards for release detection. (Emergency Standards are temporary and bypass the usual consensus requirements; they are generally replaced by permanent Standards.) While Emergency Standards were never written and the committee was reorganized after several years, five Standard Guides, one Standard Practice and no Standards on leak detection were published many years later (E1526-93, E1599-94, E1739-95, E1912-98, E1943-98 and E1990-98).

Dean Cheramie also discussed the formation of the National Workgroup and the fact that the Workgroup's product, the List of Leak Detection Evaluations for Underground Storage Tank Systems may not be legally binding in most jurisdictions outside California. The List is now in its 8th edition and was last updated in March 2001. It is a 300+ page compilation of third party validation testing of leak detection equipment, including SIR packages used with ATGs. Since evaluation protocols include a requirement to determine the probability for finding leaks as well as the probability for false alarms, tank size ranges and throughput limits were established for most equipment tested by independent laboratories. It makes little sense to debate the legality or enforceability of these limits; they were established to ensure that equipment performs within the established parameters.

This past summer, EPA and the National Workgroup sponsored a review of current third party testing protocols. Recommendations for changes should be published soon. I was honored with a request to be one of the reviewers and participated in the review process.

ATGs for Inventory Control

In the mid-80s, long before the EPA requirements, one of the first large implementations of ATGs was by Amoco, who installed some 12,000 units for inventory control. At the time, Amoco owned the gasoline in the USTs and hoped to reduce receivables by debiting dealers accounts daily on the basis of electronic inventory records derived from ATG and point-of-sales data. We learned very quickly, that UST systems are quite dynamic in their behavior, in fact each installation was somewhat different. The primary problems turned out to be: (1) a need for as-built dimensions for each tank, (2) knowledge of the tank inclination during installation and subsequent changes due to settling, and (3) estimates of tank flexing as a function of liquid level. These problems generally manifested themselves in non-linear behavior of ATGs with built-in tank charts and often resulted in a need for individually calculated strapping charts. In addition, early ATGs often lost their height measuring ability when tank bottom sediments, stirred up during deliveries, deposited on the gauges.

While the reliability of ATGs has increased significantly since the early years, their ability to read volume as a function of height is still only as good as the input data provided their processors.

ATGs for Leak Detection

In the beginning, ATG manufacturers developed the technology to use their gauges for leak detection by taking tanks out of service for some periods of time and observing the product level during that time. Somewhat later, manufacturers and software developers approached the oil companies about development of statistical methods to allow using ATGs for leak detection without scheduled downtime. At the time, the proposal made a lot of sense: much capital had been invested in ATGs and the additional costs for implementing Statistical Inventory Reconciliation (SIR) were minor. Best of all, precision leak testing at the time required significant periods of downtime and expense, both of which could now be reduced.

In order to work effectively as leak detectors, ATGs need some quiet time every day; the total quiet time may be comprised of a series of smaller blocks of time with no dispensing activities. The total daily time requirement and the minimum time of individual smaller quiet blocks vary for different manufacturers.

SIR Today

Dr. Rogers' article indicates that SIR software now has the ability to distinguish delivery discrepancies, losses from remote fills, water incursion, induced leakage and check valve malfunctions when looking for leak estimates and trying to avoid false alarms. He reached this conclusion after a four-week test period on a 2000-gallon UST. Dean Cheramie supports the position that SIR effectiveness can be improved by improving the data collection process.

While reading the articles, I could not help wondering if the same conclusions would be reached studying an operating high volume multi-tank system typically found in today's new hypermarts without first determining specific strapping charts for the USTs. Developing such strapping charts, while possible with today's computer technology, is a costly and time intensive activity for retailers operating hundreds or thousands of stations.

Large Throughput Stations

At Convex 1999 in Toronto, Philip Verleger discussed the "Changing Face of Your Customer" and projected significant growth in hypermarts dispensing gasoline. Hypermart stations are generally large facilities with two USTs and single hose blending dispensers. For some time, there have been reports of some of these new facilities regularly exceeding monthly throughputs of 800,000 gallons. Under normal operations, these throughput rates may prevent the accumulation of sufficient quiet time for SIR packages to work and result in their reporting of inconclusive results for daily leak tests.

Back to Basics

The 1988 EPA rules provided tank owners a number of options for complying with release detection requirements. For double-walled tank installations, interstitial monitors should be considered. For single-wall tanks, hydrocarbon monitors in the monitoring wells may be used. Finally, if a leak is suspected, ATGs may be put into a leak detection mode, followed by third party testing. Precision tightness testing has changed significantly with the development of alternative methods, greatly reducing the out-of-service time requirements for USTs.

Wolf Koch is founder and President of Technology Resources International, Inc. in Batavia, IL. providing consulting services in technology evaluation, development and testing, and litigation and expert witness support. He is a frequent contributor to this publication and can be reached at wolfkoch@t-r-i.com.