PRODUCT DESCRIPTION

PALS

Pipeline Advanced Leak Location System

When a leak detection test indicates a breach in a pressurized underground pipeline, the PALS offers the latest-generation technology for locating the leak.

Leak detection methods—techniques that determine whether underground piping systems are in fact leaking—have been around commercially for some time, and the number of methods is increasing annually. Reliable leak ***location*** methods are equally important, yet scarcer in the marketplace. Many users of leak detection systems face a dilemma if a leak is actually detected—how to accurately and reliably determine the location of the leak while minimizing both the disruption of service and the need for excavating buried piping.

The acoustic signal produced by a leak can be masked by background noise, and signal-processing techniques must be applied that allow the detection of the signal amid the noise. Vista Research, long recognized as a leader in signal processing, specializes in separating meaningful signals from the background noise that has been the bane of other acoustic methods. Vista's PALSystem uses a unique approach to signal processing that is based on coherence analysis. The PALS, which is gaining great commercial recognition, has regularly outperformed other acoustic methods by a wide margin.

Benefits

Accurate within Several Feet. The PALS locates leaks quickly and accurately, to within 1.5% or better of the distance between sensors, depending on that distance—usually a matter of several feet.

Almost No Down Time. A PALS measurement can be made in a few minutes.

Minimal Need for Excavation. Because the PALS can place a leak within several feet of its actual location, the scope of the necessary excavation work is vastly reduced—it is limited, essentially, to repair-related digging.

Easily Installed at Routine Access Points. The PALS can be used on any underground pipeline system that can accommodate the placement of sensors at intervals along its length. Points of access to the pipeline, such as valve pits or aboveground manifolds, can be as far apart as 500 linear feet, and there is no need to remove anti-corrosive coatings. The PALS has been used on transfer lines at bulk storage facilities and on airport hydrant fuel systems. Noisy, active environments do not impact the performance of the PALS.

A New Way to Use Acoustics

The history of the PALSystem goes back to 1991, when Vista Research demonstrated an improved method for locating leaks in pressurized underground pipelines containing fuel. Using a passive-acoustic leak location system combined with a coherence-based signal-processing algorithm, Vista Research realized a 100-fold improvement in performance (in terms of the size of the leak and the spacing between the sensors) vis-à-vis the traditional correlation-analysis

The PALS outperforms other methods by a wide margin. Even the prototype of the PALS realized a 100-fold improvement over traditional acoustic methods.

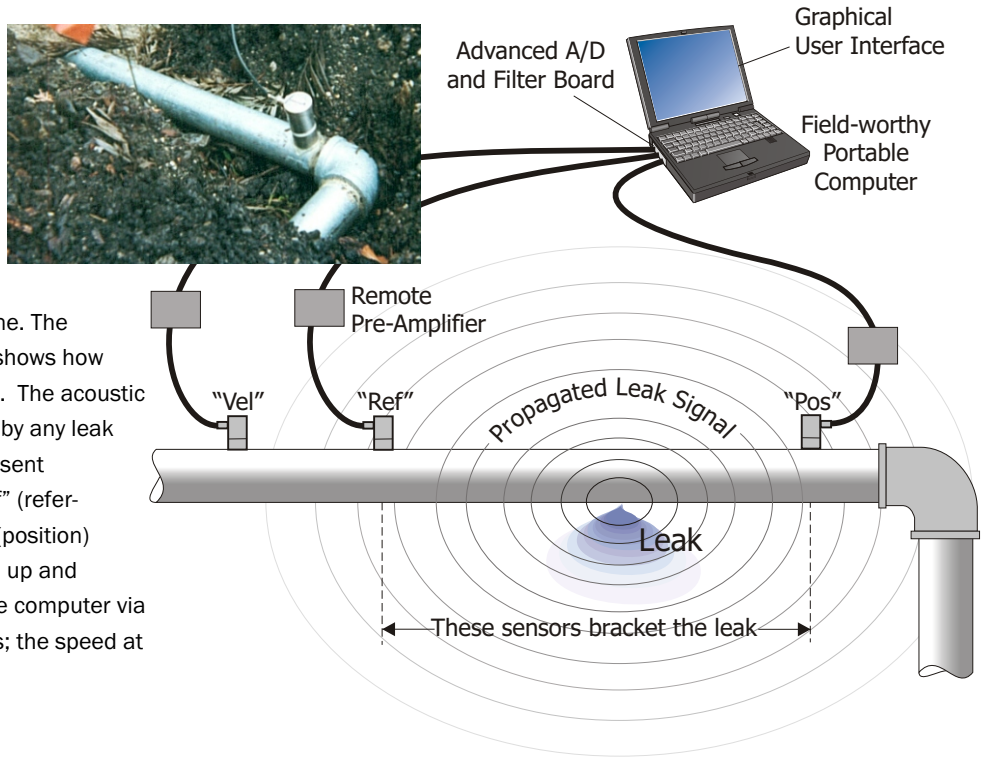
VISTA RESEARCH 755 N. Mary Ave., Sunnyvale, CA 94085 ■ 408-830-3300 ■ www.vistaleakdetection.com

approach. Field tests on a 2-inch-diameter line pressurized to 30 psi showed that, with sensors spaced 125 feet apart, the Vista method could place the leak within several feet of its actual location. The 1991 tests showed that passive acoustics was a viable method for finding leaks of environmental interest in underground fuel pipelines.

Since that time, Vista's passive-acoustic method has evolved into the PALSystem, and its performance has improved even more. Sensors can be spaced as far as 500 feet apart without affecting the system's ability to locate a leak to within a few feet.

Description

The PALS is a portable passive-acoustic system comprised of three acoustic sensors, three small pre-amplifiers, and a portable computer equipped with a data acquisition card. Each sensor measures the acoustic signal generated by the turbulent flow through a hole in the pipeline. The diagram at right shows how leaks are located. The acoustic signal generated by any leak that might be present between the "Ref" (reference) and "Pos" (position) sensors is picked up and transmitted to the computer via the pre-amplifiers; the speed at which the acoustic signal is propagating through the pipeline is measured in the region between the "Vel" (velocity) and Ref sensors, which—unlike Ref and Pos—do not bracket the leak. For the leak to be correctly located, the distances between the sensors must be known, since the measurement made by the PALS determines the location of the leak relative to the reference sensor. A leak location measurement can be made in as little as 2 to 5 minutes.



Performance

The PALS performs well over a wide range of leak rates, pipeline configurations, backfill materials and backfill conditions—that is, under any condition encountered in an operational setting. Furthermore, it is impervious to background noise, even in settings as inhospitable as a jet aircraft flight line.

When the sensors are spaced less than 200 feet apart, the accuracy of the PALS is within 3 feet. When the sensors are spaced further apart, its accuracy remains at or better than 1.5% of the sensor interval. Even in field tests where the distance between sensors exceeded 500 feet, the PALS routinely achieved the same high performance.

Practicality

The PALS excels in operational practicality. On most bulk and hydrant lines, sensors can be mounted at available access points without the need for excavation. Furthermore, sensors can be mounted on the ends or sides of a flange connection without sacrificing performance —meaning that the coating used

to protect the pipe from corrosion does not have to be removed in order to conduct a leak location test.

Evaluation

The accuracy of the PALS was evaluated as part of the EPA's Strategic Environmental Research and Development Program (SERDP). The site of the evaluation was the EPA's SERDP Test Pipeline Facility (STPF) in Edison, New Jersey, where a 1050-foot, 12-inch-diameter line was made available for PALS testing between 14 and 16 August 2000.

Ten different sensor separation distances, ranging from 135 to 517 feet, were used; the median separation distance was 360.0 feet. In addition, there were a variety of leak locations and sensor positions. During all the tests, pressure in the pipeline was 70 psi; the contents of line, during these tests, was water.

In half of the tests, all sensors were mounted directly on the pipe wall. In the other half, the velocity and position sensors were mounted on the pipe wall, but the reference sensor was mounted on a blind flange at the end of a vertical riser. The PALS' accuracy did not change with leak rate or with the location of the leak relative to the reference sensor. The PALS located leaks to within 3 feet when the sensors were less than 200 feet apart and to within 1.5% of sensor separation distances greater than 200 feet. The results of 18 tests are summarized above.

Results of the Leak Location Tests at the STPF Showing the Accuracy of the PALS

(Sensor Separation Distances Were between 159.5 and 516.5 Feet)

	PALS Accuracy in Terms of Location Error	
	(feet)	(% of distance between sensors)
Average	3.10	1.10
Median	2.65	0.80
Standard Deviation	2.02	0.77

Acknowledgments

The PALS was developed by Vista Research with technical support from the U.S. Naval Facilities Engineering Service Center (NFESC) and funding from the Pollution Abatement Ashore Program managed by the Naval Facilities Engineering Command and sponsored by the Environmental Protection, Safety and Occupational Health Division (N45) of the Chief of Naval Operations. The PALS was demonstrated under the Department of Defense's Environmental Security Technology Certification Program (ESTCP).