

Development of Advanced PipeGuard™ An Acoustic Damage Prevention System

Description: An acoustic pipeline monitoring system that will warn pipeline operators of impending damage to pipelines.

Status: Advanced software and hardware development underway.

BENEFITS

The natural gas industry has an excellent record of operating and maintaining safe and efficient pipeline systems. However, threat of damage from a third party excavator continues to be an ongoing concern. Although there have been major improvements in “one call” system operations and pipeline mark-outs, damages by outside forces can still occur. As a result, NYSEARCH continues to seek new technologies to proactively prevent damages to transmission and/or distribution system pipelines.

With PHMSA cofunding, NYSEARCH is working with Magal-Senstar Inc. (MSI) to take their existing PipeGuard™ technology, an acoustic-based remote monitoring application and develop it to meet gas industry needs. MSI’s Pipe Guard™ technology is a damage prevention application that offers an acoustic underground detection system for buried pipelines (Figure 1). Other technologies that are

available on the market are more expensive and are better suited for protecting long pipeline runs, typically ten miles or greater.

As a result of this program, the “Advanced PipeGuard™” system will provide pipeline companies with a cost effective solution to provide protection for short pipe sections, 500 feet or greater. This technology will reduce the need for certain routine survey patrols in high consequence areas or pipelines in critical locations. The new system will provide control centers and mobile operators with improved awareness of an excavating event before contact is made, thereby reducing pipeline damage.

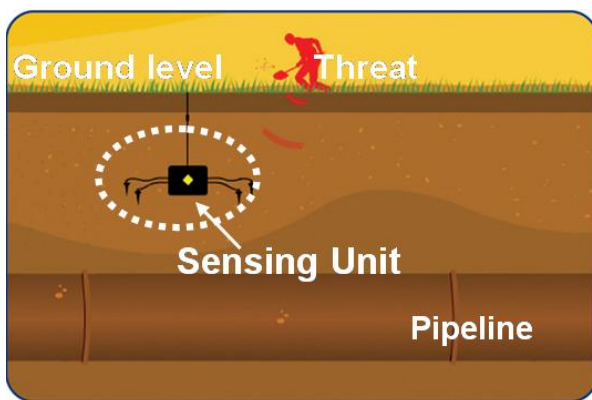


Figure 1: PipeGuard™ Concept



Figure 2: Typical Backhoe Excavation

BACKGROUND

Damages caused by construction equipment such as backhoes, HDD machines, etc. can be a major threat and can cause significant loss of property and/or jeopardize public safety. One solution to help mitigate damage concerns involves installing a remote monitoring system

that can detect third party excavators digging near a pipeline facility before damage can occur. MSI, a leader in developing security systems in the U.S and overseas, has a suite of technologies that have potential for preventing pipeline damages. A NYSEARCH test program showed that PipeGuard™ technology was the most applicable and promising approach for the natural gas system application (Figure 2).

TECHNICAL APPROACH

The Advanced PipeGuard™ system will make use of existing technology. With this technology, MSI plans to develop new hardware and software to improve PipeGuard's detection algorithms for increased sensitivity. In addition, MSI will streamline the system in an effort to reduce purchase cost. The Advanced



Figure 3: Sensing Unit with Geophones

PipeGuard™ system will consist of two to three sensing units that are capable of protecting up to 1000 feet of buried pipe. The sensing units will include state-of-the-art geophones for sensing ground vibrations (Figure 3). The new digital processor will evaluate underground seismic signals and classify excavating events up to 300 feet away from a sensing unit. The system will communicate wirelessly between sensing units to a pipeline/utility operator located at a remote location away from the site. The sensing units are battery powered and connected to a series of geophones buried near the pipeline.

Advanced PipeGuard™ is targeted to be relatively inexpensive and easy to install. A Windows-based management application (called Fortis™) provides a geo-spatial view of the site.

It receives alerts from remote sensing units, displays the alarm time, location, event duration and alarm confidence level (Figure 4).

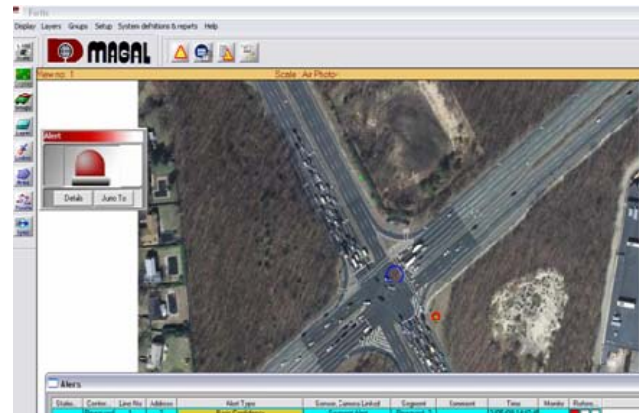


Figure 4: User Interface at Remote Location

The system will analyze signals to determine threat location in terms of direction and separate benign threats from real ones. A 1% false alarm rate has been targeted for this project. Field data for various types of equipment typically used by third party operators is being gathered. Equipment that was tested include small and large backhoes, hand shovel, pavement breaker, post-hole tools and drills. This data is being used to develop two Advanced PipeGuard™ prototype systems for field testing. They will be tested and installed at gas company pipeline test sites in suburban areas with heavily trafficked roadways.

PROGRAM STATUS

Initial field test data has been obtained and used to define improvements. The new system hardware and software are under development. Beta prototype testing is underway.

Highlights

- Remote detection of excavating events only
- Portable self-contained
- Relative low cost – easy to install
- Wireless communications
- Targeting 99% accuracy; 1% false alarm rate

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