Northeast GAS ASSOCIATION
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Technology Brief

First Pass Leak Detection (FPLD)

Description: **A technology advancement and test program to increase the probability of detecting otherwise missed leaks while performing traditional walking surveys**

Status: **Advancements and trials of various instrument technologies, walking patterns and automated survey location records are being tested in 2021.**

BENEFITS

The benefit of improved effectiveness in a "first pass leak detection" approach is an overall thoroughness and confidence in detecting leaks. With this more aggressive approach, there is also an increased likelihood of capturing more leaks resulting in increased safety. Operators are keen to reduce missed leaks and increase overall pipeline integrity.

BACKGROUND

There are many instruments and procedures used for performing leak detection within LDCs. Traditional leak detection survey relies on walking with handheld instrumentation by trained and experienced personnel. Mobile and aerial methane detection instruments are also now becoming integrated into leak monitoring practices. Ideally, an optimal leak survey identifies all leaks on a pipeline. The identification of leaks can vary due to weather, ground resistance, migration and other factors. For instance, rain or snow melt can cap or reroute the migration path of the leak, obscuring detection during the leak survey. Also factors such as presence of nearby infrastructure, underground ducts, traffic congestion, number of buildings/obstructions and a range of realistic conditions in LDCs' urban and suburban territories can influence the presence, concentration and dissipation of a pipeline leak.

TECHNICAL APPROACH

The project objective is to evaluate improvements to leak survey effectiveness. Our goal is to optimize use of instrumentation and data acquisition techniques to maximize the detection of pipeline leaks predominantly for walking survey. This is being augmented by other methods to achieve maximum leak detection in one pass.

Commercially available and advanced prototype methane detection instruments have been evaluated. The consideration of a range of technologies will provide an advantage to expanding methane detection capabilities when used in combination during the walking survey. Remote methane leak detection or detection without being within a gas plume, has advantages and disadvantages as compared to open path laser spectroscopy (OPLS), see Figure 2, detection by being within a gas plume (See Figure 1). Combining technologies simultaneously provides improved capability of methane detection during FPLD efforts. (See Figure 2).

Figure 1: RMLD type methane detector with GPS tracking of walking survey and leak location identification superimposed on a street map and gas pipe map

Figure 2: Simultaneous RMLD, FI/GMI and OPLS walking and wearable technologies with leak tracking identification superimposed GPS bread crumbs on street and gas pipe maps

In addition to selecting optimized methane detection instruments, the project included evaluation of the best walking pattern to take advantage of the differing instruments. Experimentation with patterns of walking surveys has been completed.

This evaluation provides a departure from the typical "H" pattern walking survey, see Figure 3.

PROGAM STATUS

A Design of Experiment (DOE) has been created and used to capture and evaluate actual results of testing and development efforts. Metrics include tracking, time efficiency and effectiveness in detecting "blind" native and simulated leaks.

Field testing has been conducted at multiple gas company members to apply the FPLD approach in suburban areas and in extreme conditions such as hot desert conditions. The outcome of this development includes a new survey process with a higher probable rate of leak detection and provide the immediacy of leak classification with appropriate crew response and records. It was determined from the two field test campaigns that this approach maximized the potential for finding all leaks.

Figure 3: Leak survey testing

The project is expected to be completed by early 2023.

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Highlights

- Walking survey advancements can take advantage of multiple detection technology simultaneously to approach 100% leak detection
- A Design of Experiment process following by validation in live field tests had provided high confidence in the improvements offered by the FPLD methods