

Leak Detection System Using PFT Analysis

Description: An instrument that uses perfluorocarbon tracer (PFT) compounds to help pinpoint difficult-to-locate gas pipeline leaks

Status: Beta prototype instrument being readied for field test

BENEFITS

The benefits and use of PFT technology include increasing efficiency of barhole sampling and improving the leak pinpointing process. This will help reduce costs associated with leak investigation activity, improve system safety and help to reduce GHG emissions. PFT technology can also be applied to newly constructed pipelines that experience a loss in pressure due to small leak(s) during the required pressure test.

BACKGROUND

Perfluorocarbon Tracer technology has been applied in many industries for the purpose of leak detection, which includes HVAC, medical field, electric cable leaks and environmental monitoring. In 1992, this method was applied for the first time to pinpoint dielectric fluid leaks in underground high voltage cables. The time required to pinpoint a leak is critical for safety and economic reasons.

Perfluorocarbon Tracers are chemical compounds that are environmentally, biologically benign and compatible with natural gas pipelines and electric cables. By introducing PFTs into a gas pipe, system upstream of a leak area, they can readily be detected by a special instrument capable of measuring PFT samples in parts per billion (ppb). The PFT instrument allows technicians to sample barholes directly and determine within minutes if there is PFT present in the gas mixture being analyzed.

National Grid has worked with Brookhaven National Lab (BNL) to apply PFT leak detection technology (formerly applied to electric cables) to locate difficult leaks in natural gas pipelines.

The PFT technology that was developed included a barholing process, drilling/tapping, soil aeration and sample analysis. The project resulted in the development of a “tracer and tagging” method for gas pipelines and a special barhole sampling process. The first PFT system utilized a large expensive analyzer that was vehicle mounted and required an experienced technician to operate. To improve this technology, pipeline companies needed a smaller, portable, less expensive system that is able to quickly analyze and assess barhole samples in the field (Figure 1).



Figure 1: New PFT Analyzer

TECHNICAL APPROACH

The gas industry and NYSEARCH member companies are continually looking for ways to improve the pipe leak pinpointing process, especially in cases where system leaks are difficult to locate. Although difficult-to-locate leaks occur infrequently, they are costly to a pipeline company and, at times, require numerous work visits before a repair is made. NYSEARCH is working with BNL to develop a

new field instrument and method to improve the locating process. The technology uses a perfluorocarbon tracer (PFT) compound to find and isolate pipe leaks.

Location of leaks in natural gas pipelines, whether existing or newly constructed is a multi-step process. Once the general location is determined by identifying the leak area, a bar-hole sampling process is used to pinpoint leak(s) (Figure 2). PFT analysis has been used successfully to find difficult-to-locate leaks in many buried substructures. This method typically requires the use of expensive equipment and laboratory analysis.

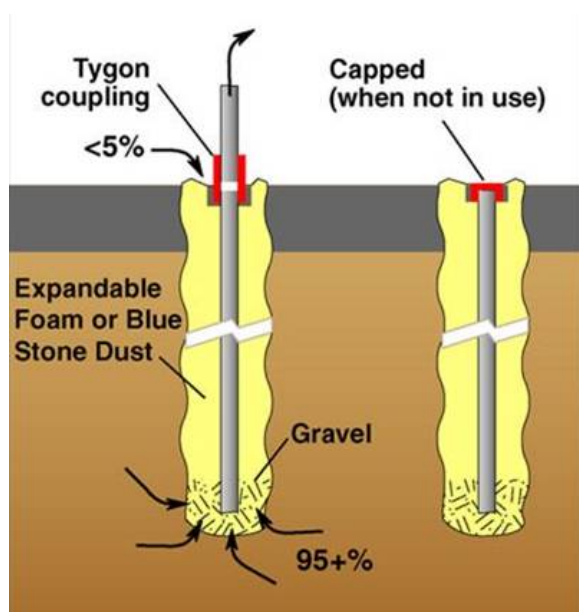


Figure 2: New Barhole Sampling Method

The goal of this program was to increase the effectiveness of locating underground pipeline leaks using PFT “tagging” and barhole sampling. The “tagging” process involves introducing very small amounts of PFT material into a pipeline upstream of the leak location. After a brief waiting period, a special barholing process is applied to obtain air/gas samples for analysis. BNL developed a portable laser based instrument for measuring PFT laden samples from barholes that is relatively simple to operate. The new smaller portable system is equipped with an onboard monitor that is able to display measurements from barhole samples within minutes (Figure 3). The sensitivity of the proposed instrument to multiple PFT compounds will allow different underground

pipelines in the same area to be uniquely tagged. If needed, it can also be used to locate dielectric fluid leaks in underground power transmission cables.

The project resulted in a prototype instrument that can measure PFTs from leaks in gas pipelines tagged with PFTs for barhole samples. The PFT instrument is user friendly, portable enough to be transported by a single person and capable of taking samples without the use of sample bags. Following additional testing, the project will deliver a working prototype instrument that can be commercially manufactured and used by trained gas company personnel.



Figure 3: User Interface

PROGRAM STATUS

The PFT instrument is in final stages of development in an effort to obtain the required sensitivity.

Highlights

- Analyze for difficult-to-locate leaks
- Reduce leak investigate costs
- Reduce GHG emissions related to leaks
- Reduce customer complaints

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