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**The Sniffers, Belgium,** outline an alternative way  
of detecting leaks in pipelines.

# Dogs detecting GAS LEAKS







**P**ipeline network managers apply a multitude of tactics in order to manage the integrity of their assets. Alongside detecting techniques that use measuring equipment, assessing the network using sniffing dogs has unique advantages and should be used in parallel.

### **Limitations of modern techniques**

Transportation and distribution of liquids and gases through pipelines is the best multimodal method. However, although pipelines are the safest means of energy transportation, they also pose challenges for pipeline network operators.

After a series of accidents in various parts of the world, proper risk assessments of a pipeline network is essential to ensure safe operation of assets. The two main reasons for incidents and disruption of continuous supply are excavation damage to the pipeline and corrosion of steel pipes. The overall goal of the pipeline industry is to achieve zero leakage.

As a strategy to minimise the occurrence of these two key physical threats and to avoid personal injuries and transportation disruption, a combination of external and internal inspection and detection tactics have been put in place. Intelligent pigging, inspections on foot, by car or from the air (helicopter, plane, satellite), and continuous



measuring systems have major limitations when applied in practice.

Looking at the mass balance approach, intelligent pigging, fibre optic cables and sensing technology, underground pipeline systems tend not to be designed to use these techniques and adaptation requires huge investments or setup costs.

Moreover, underground pipeline systems that are able to use these leak detection techniques have limits that are often mentioned in barrels per day and leave too much room for errors. In turn, this causes a high risk of pollution and increases soil remediation costs by up to millions of dollars each week.

With these technical limitations and high environmental and economical threats, it is still inevitable that the pipeline market raises the demand for a different and more effective approach



Figure 1. The Sniffers' dog searching for a gas leak.



Figure 2. Executing an annual leak detection survey.



Figure 3. A dog detecting a leak.

to detecting leaks in an economic, fast and efficient way. One answer to this challenge lies in specially trained sniffer dogs.

### Minimising environmental impact

Carefully selected and trained dogs have the ability to detect specific smells. The sensitive nose of sniffers dogs along with a lengthy and thorough training journey makes it possible to search for leaks on underground pipelines using dogs in industrial circumstances. A focused training programme delivers sniffing dogs for specific smells.

The high sensitivity of the nose of sniffing dogs is unmatched compared to available measuring instruments. The parts per million detection level of equipment limits the detection of small leaks on underground pipelines. Dogs' sniffing ability of up to parts per billion, however, makes it possible to identify tiny gas or oil leaks in a pipeline. In practice, months before a propagating leak is detected with industrial leak survey equipment, a dog sniffing survey would already have identified the leak. Pipeline managers can immediately repair small leaks before important environmental damage or serious safety exposure would take place.

Almost all underground pipelines are accessible for sniffing dogs; a dog's mobility brings its nose above pipelines in rural areas, through woods, crossing mountains and through fields with dense vegetation. Many measuring instruments cannot be used in these circumstances at an acceptable pace.

The Sniffers has developed this sniffing dog capability to a best high class level. A comparative study on a German propylene pipeline running through agricultural corn fields, from Cologne to Dormhagen (Germany), was evaluated by TÜV Nord to confirm the effectiveness of the dogs. Soon after, The Sniffers received official certification for the dogs and handlers' working method.

A similar recognition for The Sniffers' dogs took place during an innovation workshop for Belgian pipeline companies, the Ministry of Economic Affairs and a neutral notified body. A comparative test was organised to reveal the added value of sniffing dogs. Two situations were tested: dogs tracking down gas leaks in industrial environments (production, pump and/or measuring station) and dogs tracking simulated leaks of products (ethylene, propylene and butane) on different types of terrain with a depth of over 1 m. In both circumstances, The Sniffers' dogs could detect these leaks and simulations much faster than technological equipment. All aspects of the sniffing process; the selection and training of the dogs, the practices of the handlers, the quality assurance approach, the work preparation and the continued focus on results are all critical to ensure a reliable and economical sniffing survey of an underground pipeline.

### Case studies

A pipeline challenge in France happened to be the ideal setting for leak detection with sniffing dogs. The Sniffers was engaged to inspect an 800 km section of underground ethylene pipelines in France. Two teams of trained sniffing dogs and their handlers screened the pipeline through the rural landscape. With the pipeline running through the Alps, the teams encountered mountains of 1200 m, rivers, paddocks containing bulls, barbed wire fences, suburban areas, private properties, highways and railways across the four month survey.

During the survey, a mobile application, 'Perseus', was intensively used to track the walking position and the pipeline location in order to register a qualitative description of the status of the armature along the pipeline and report urgently required actions. The Sniffers developed this application, which focuses on the efficiency of inspection activities and helps dog handlers to communicate the observations made in the field in a transparent way to the pipeline manager.

In 2012, a pipeline incident in Germany sparked intense discussions regarding approaches to pipe leakages. Where traditional leak detection techniques and systems have shown to be unable to detect leakages at an early stage, future leak detection strategies require small leakage detection capabilities. Until now, these tiny leaks fell under the radar, having important financial and environmental impacts.

A case study comparing leak detection dogs to other existing techniques has demonstrated the technical capabilities of the dogs. When it comes to evaluation of the necessary investment, precise leak detection methods with equipment require measurements underground and exactly above the pipeline to meet the higher demands. This method requires manpower to localise the pipeline, drill holes at least every metre, do the leak detection at least every metre and for the additional logistical support. This complex approach to meet future legislation allows for progress of only a few hundred metres per day. Dogs have the same detection capacity, even from a distance, and require only one handler with a dog to have a progress of multiple kilometres per day. This positions dogs as future legislation proof within a realistic financial budget.

### **Effective detection of illegal tapping**

In certain countries and regions, illegal pipeline tapping is popular and widespread. Even in western countries, theft of pipeline product still occurs. Recent examples in the UK and Belgium indicate that pipeline managers should be cautious. Aside from the financial consequences of illegal tapping, the integrity of the pipeline and the increased risk to a smooth operation is detrimental for pipeline operators.

In some cases, a loss of pressure in the pipeline is detected. In other situations, the mass balance does not give a clear answer on the loss of product. However, in all cases, the position of the illegal tap along the pipeline is very difficult to locate.

Loss of pressure on a pipeline network in Georgia was a first indication of a potential illegal tapping. Several kilometres of underground pipeline in non-residential areas, and so without any permanent observation, nourished the suspicion of an illegal tap. As a first measure, the pipeline manager checked the network every day by guards on horses. However, no single visual indication of fraudulent activity was observed. The Sniffers were requested to screen the suspicious network over a distance of 20 km.

Two teams, each consisting of one sniffing dog and its handler, surveyed the underground pipeline during a two week project. Supported by armed guards, a specific location in an open area, without any buildings or trees close by, was identified by both dogs. What seemed an impossible location was monitored during night hours. Detection of the exact location of this illegal tap was a breakthrough for the pipeline manager to avoid financial losses and the increased risk to the integrity of the underground network.

### **The dogs**

With broad experience in the field of emission measurement and leak detection in underground pipelines, The Sniffers has been able to extend its capabilities using the natural abilities of dogs. The sensitive nose of well selected and trained dogs, along with a well-developed and certified process, makes it possible to lift the bar of leak detection. Due to the parts per billion detection level, very small leaks can now be detected, giving network managers an early signal for action. Using this sniffing dogs detection capability saves money, avoids environmental damages and increases the overall integrity of the network. 