Sniffing out solutions

Kristof Verwaest and Bart Wauterickx, The Sniffers, Belgium, consider some of the challenges that extreme environments have on pipeline inspection operations.

Pipeline networks are used across the world to transport fluids and gases from exploration and production towards consumers. Things – such as geology and hazards – that may be barriers to human beings, may not be barriers at all for pipeline infrastructure. Extreme pipeline environments often require intelligent and unconventional use of pipeline management and inspection approaches.

The Sniffers is often consulted to measure emissions to the atmosphere, to detect and quantify energy leaks, and to evaluate and assist in maintaining the integrity of pipeline networks. Ultimately, its services result in the reduction of emissions, the saving of energy and the prolongation of the life time of assets. When conducting external line pipeline inspections and management surveys, the company applies several techniques to manage the integrity of its customers' assets. Its goal is to guide the pipeline manager in accepting the most suitable solution for a specific critical situation.

Research and development

With the goal of creating technical solutions that can be commercialised, research and development (R&D) often targets new products or services in the larger markets and not in the unconventional smaller markets. Hence, R&D and extreme conditions often do not go hand in hand. Typically, it is more

Figure 1. Sniffing dog searching for a leak.

Figure 2. Crossing the Alps during a pipeline leak detection operation.

effective to tackle an extreme, unconventional and challenging project using an established intelligent approach rather than using the latest technical advancements on the market.

More often than not, new techniques have major limitations when put into practice. Existing underground pipeline systems or pipeline systems in extreme conditions do not tend to be designed to use the newest techniques and having them adapted requires huge investments or set up costs. Due to these technical limitations, as well as high environmental and economical threats, the pipeline leak detection market has raised its demand for a more effective approach to identify leaks in an economic, fast and efficient way, that can also be used in difficult environments. One solution on offer is The Sniffers' specially trained sniffing dogs.

Minimising environmental impacts

The Sniffers carefully selects and trains dogs on their natural capability to detect specific smells. The sensitive nose of sniffing dogs, in combination with a lengthy and thorough training journey, makes it possible to search for leaks on underground pipelines that are located in difficult environments.

Sniffing dogs have highly sensitive noses, which are unrivalled compared to other available measuring instruments. The parts per million detection level of equipment limits the detection of small leaks on underground pipelines. Meanwhile, capable of sniffing up to parts per billion, the dogs' noses can identify a tiny gas or oil leak on both aboveground and underground pipelines.

In practice, months before a propagating leak is detected with industrial leak survey equipment, a dog sniffing survey would have already identified the leak. Therefore, a pipeline manager is able to repair a small leak immediately and, importantly, before important environmental damage or serious safety exposure occurs.

Generally, underground pipelines are always accessible to a sniffing dog. A dog's mobility can bring its nose above pipelines that are located in rural areas, through woods, across mountains or through fields with dense vegetation, to name a few. Several measuring instruments cannot be used in these circumstances at an acceptable pace.

Detecting illegal tapping

In some countries and regions, illegal pipeline tapping is reasonably common and widespread. Even in western countries, theft of pipeline product still occurs. Recent examples in the UK and Belgium have highlighted why pipeline managers across the world should be cautious of this costly crime. Besides the financial consequences of illegal tapping, the integrity of the pipeline and the increased risk for a smooth continuous operation can be detrimental for an operator.

While in some cases, loss of pressure in the pipeline can be detected using advanced measurement and inspection tools, 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 always made difficult to find as it is vital for the crooks.

Illegal taps are now being installed in a professional manner following the best practices. However, in most cases, a small spill during the installation or during the tapping process itself is highly feasible. One simple drop ending in the soil at 2 - 3 m underground can leave a scent trace for sniffing dogs. While these small traces are often difficult to detect, or are even undetectable using leak detection equipment, the highly sensitive noses of sniffer dogs can detect them.

Case study

A loss of pressure on a DN 200 oil pipeline network in Eastern Europe was a first indication of a potential illegal tap. Several kilometres of underground pipeline in a non-residential area, without close by 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 without result. No visual indication of any fraudulent activity was found.

The Sniffers was then requested to screen the suspicious network over a distance of 20 km. Two teams (each consisting of a sniffing dog and its handler) surveyed the underground pipeline during a two week long project. Supported by armed guards, a location in an exposed area, without any buildings or trees close by, was identified by the dogs.

The dogs detected the illegal tapping point, which thieves used during night hours. As a result of the sniffer dogs finding the location of the leak, the pipeline owner found that tanker trucks were being filled with tens of thousands of litres of fuel every night.

The owner knew that it was experiencing losses but could never find the cause. When The Sniffers' dogs detected the exact location of the illegal tap, this was a breakthrough for the operator in its fight against the financial losses and the increased risk of the integrity of the underground pipeline network.

In South America, where The Sniffers was invited to inspect a 200 km pipeline for possible leaks, the dogs managed to pinpoint a leak and to find an illegal tap, even under extreme and continuous changing conditions. The team faced and had to adapt to a range of different conditions, including: high temperatures of up to 40°C, as well as both dry, sandy areas and rainy, muddy areas.

Leak detection in the Alps

France happened to be the perfect setting to demonstrate the capabilities of sniffing dogs for leak detection. The Sniffers was contracted to inspect 800 km of 8 in. underground pipelines in the Alps, within which two teams (each consisting of a trained sniffing dog and its handler) screened the pipeline through the rural landscape. The Alps is a diverse area containing mountains of up to 1200 m, rivers, paddocks containing bulls, barbed wire fences, suburban areas, private properties, highways, railways, etc. Each of these were encountered and could have presented challenges across the four month survey.

During the operation, The Sniffers' in-house developed mobile application, Perseus, was intensively used to track the walking position and pipeline location, to register a qualitative description of the status of the environment, specific objects and markers along the pipeline, and to report the most urgent required actions online. This application focuses on the efficiency of the inspection activity and helps dog handlers communicate the observations in the field online to the pipeline manager in a transparent way.

Conclusion

With a range of experience in the field of emission measurement, leak detection and underground pipeline management, The Sniffers is able to take advantage of dogs' extremely sensitive, natural leak detection capabilities. The sensitive nose of well-selected and trained dogs, the natural intelligence of human beings, combined with a well-developed and certified process, makes it possible to undertake leak detection and pipeline management operations in almost every environment, giving network managers an early and practical signal for action.

Adding a pragmatic and practical approach to established techniques, as well as using suitable measuring equipment and solutions can save money, avoid environmental damages and increase the overall integrity of a pipeline network, regardless of its location.