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North East and Yorkshire Section

Leak detection dogs

The North East and Yorkshire Section received a presentation from Antony Bullas, Penspen Ltd on leak detection dogs at their paper evening in February 2010.

Oil and gas pipelines are a safe and efficient method of transporting hydrocarbons, but as the number of pipelines increase, and the average age of pipelines increases, there will be leaks.

Modern pipeline systems usually have sophisticated on-line, real time leak detection systems, but these have detection tolerances of, typically, 1% of flow. For high throughput pipelines this would be a large amount of product lost. Older pipelines often do not have sophisticated leak detection systems, and even larger leaks could go undetected. Hence, pipeline operators use a variety of other leak detection methods, such as foot patrols and aerial surveys, to complement their on-line methods.

Animals could offer an additional complimentary method: animals have an acute sense of smell, and can reliably detect a variety of scents. They are currently working in important roles detecting explosives, drugs, and



Jet fuel sample in the specially designed 'leak-tube'.

cadavers, but now, dogs have also been successfully used to detect leaks on pipelines.

The story so far . . .

Since 2007, Penspen Ltd UK, in conjunction with Newcastle University, UK, has been conducting research to understand how canines could be used for leak location on pipelines.

Initial research work showed that Blitzen, a black Labrador from Dog Detectives Ltd, could be trained to

identify traces of jet fuel (used in jet engines on aeroplanes) from a pipeline and that he could distinguish between different types of hydrocarbon. Blitzen was no stranger to the oil and gas world having worked as an explosives detection dog at a refinery in Saudi Arabia.

In subsequent research, Wallace, a German Longhaired Pointer, who previously worked as a drug detection dog, found samples of jet fuel that were buried along a pipeline right of way; this was to determine the size of leak and depth of leak which a dog could reliably detect. The results were encouraging, with the dog detecting 86% of these simulated leaks, identifying quantities as small as 5ml, buried at depths of up to 800mm.

The latest study, working again with Blitzen on Newcastle University's farm in Northumberland, investigated the reliability of the dog by conducting multiple tests to develop a confidence in the dog's ability. The tests included looking at buried jet fuel samples along with samples of jet fuel on the ground surface. Blitzen managed to find 90% of single droplet samples (about 0.5ml) of jet fuel along a track.

Both dogs have been repeatedly finding jet fuel samples that are far smaller than the amount of product that would leak through a pin hole in a pipeline.

Working dogs

Dogs enjoy work and the two dogs clearly enjoyed the leak detection tests. The dog searches by 'quartering' the search area, scanning the width of the right of way with their nose just above the ground ensuring that no smell is left 'un-sniffed'. When the 'target scent' (in this case jet fuel) is detected the dogs spirals into where they believe the

Burying the 'leak-tube' along the pipeline route.



source of the smell is located. The presence of a leak is identified by the dog using their indication technique: for Wallace this is digging at the scent; and, for Blitzen this is standing still with his shoulders haunched above the scent.

Potential uses of canines

The research has clearly shown that dogs can be used to compliment existing patrols and leak detection systems. The dogs would be particularly useful for:

- areas where heavy corrosion has been identified by in-line inspection;
- where coating problems have been identified by above ground surveys;
- 'un-piggable' pipelines;
- locations with poor cathodic protection (CP) coverage;
- where there are suspected 'illegal taps' (theft from pipelines);
- following a hydrotest where the water has been scented; and,
- any pipeline where additional peace of mind is required about a pipeline's integrity.

Using sniffer dogs, to survey areas like those mentioned above, can greatly increase the probability of finding any leaks. Also, it provides the operator with additional assurance if no leaks are found.

Training the dog

It takes around six months to train a sniffer dog, and around two weeks to change the 'target scent' that the dog seeks out. This could be from drugs to explosives or from jet fuel to natural gas. It is possible to train the dogs to identify up to ten different scents at any one time. In principle, an operator could



Wallace successfully finding jet fuel along a pipeline route.

Results gathered since the start of the project have shown dogs to have a good detection rate of small simulated leaks, combined with a low number of 'false alarms', and they are also good fun to work with!

send a sample of their product to allow the dogs to be trained and calibrated, by approved dog trainers, to detect that scent. The dogs' accuracy and reliability can then be confirmed to the operator prior to the dog being taken to site.

Future studies

Future studies are set to define other limitations in which the dogs can work, such as wind speed and the amount of rain. Also, there are plans to investigate the effects of different soil types, hydrocarbons (e.g. methane), and to carry out further tests similar to those already conducted to increase the statistical confidence of the results. All previous work has been supported by Manchester Jetline Ltd, UK; other sponsors can become involved, and natural gas pipeline operators would be particularly welcome.

Conclusions

The research so far has shown that dogs could be used as a supplementary method of detecting leaks. Results gathered since the start of the project have shown dogs to have a good detection rate of small simulated leaks, combined with a low number of 'false alarms', and they are also good fun to work with!

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Blitzen looking for a 'leak-tube'.

