A Higher Level of Performance

Fibre Optic Monitoring Solutions for

Oil & Gas / Water Pipelines

For more information, please visit >
www.hawkmeasure.com

Features

HAWK has developed a unique ability to monitor all the needed variables in a concise design whereby the following can be monitored individually or combined allowing a design to be tailored for the exact needs for each application and customer needs now and in the future.

- Sound/Vibration
- Temperature/Vibration
- Temperature Only
- Strain Only
- Temperature / Vibration / Strain / Sound

This modular hardware and software is unique in the world and has world leading specifications and software development for false positive minimisation and maximum flexibility for specific in-situ customer needs.

The systems can be for above ground and buried pipelines, with sensitivity and performance appropriate for each type or combined above and below ground installations.

Applications

Pipeline performance monitoring above and below ground.

All Liquids and Gases within pipe systems.

Specifications for multi-mode sensing are appropriate to detect with excellent reliability are Vibration, Sound, Temperature and Temperature Change, Pipeline Strain, Frequency Identification for Pipe Hole Size all within typically 500 mm from the source of the monitored variables.

Third Party Intrusion can be combined within the Hardware/Software designs for maximum positive detection, and minimised false positives.

Distances up to 50 km (greater with lowered specification requirements).

Single or Multiple Cable for redundancy and performance enhancement, combined with the ability for data transfer along spare fibres.

Baseline data storage for historical review and comparison.

Signal analysis with on-board flexible filtering for clearer more accurate testing and data checking prior to alarm conditions being broadcast.

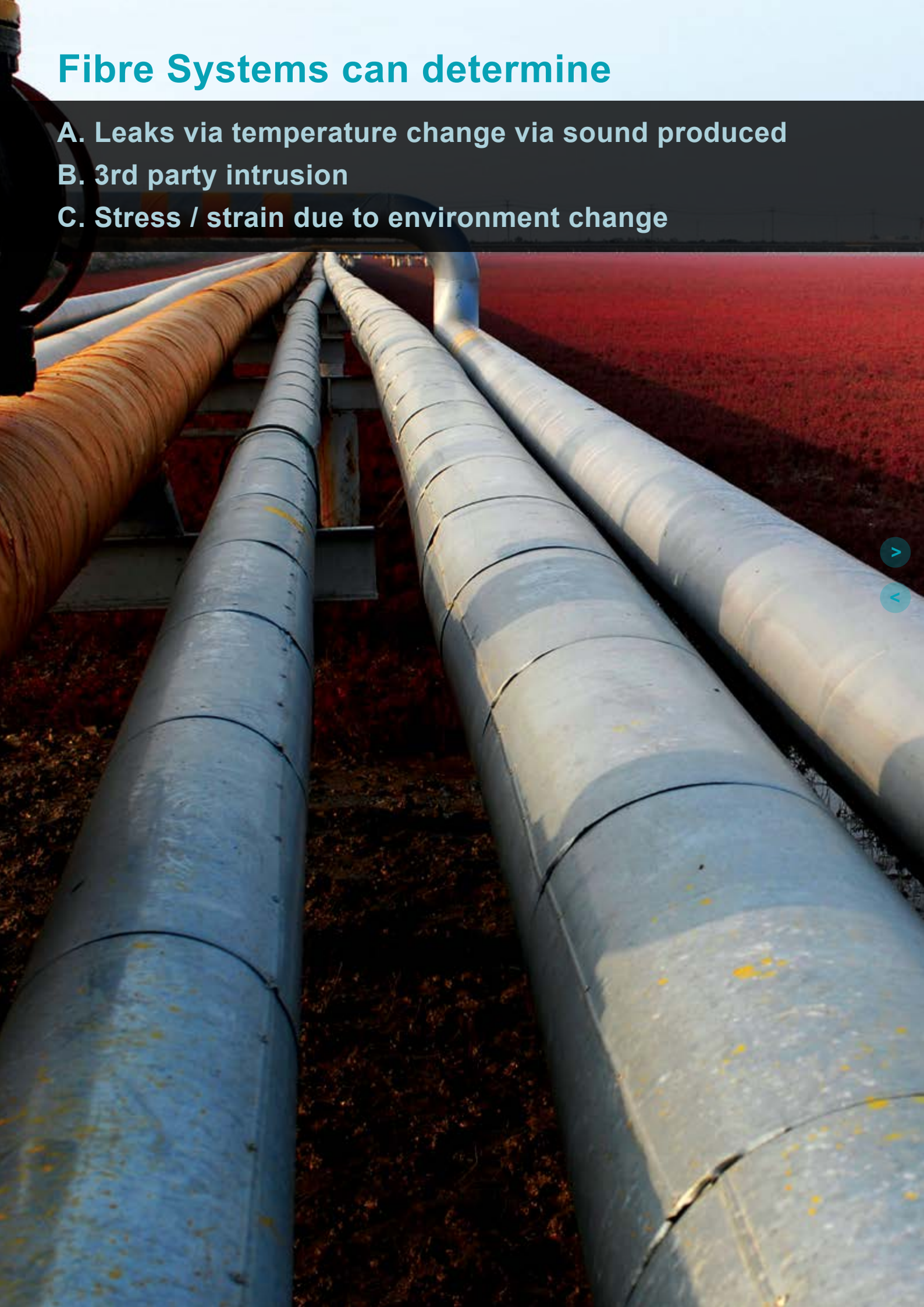
Real Time instant update at all points along the cable for any and all of the variables deemed important.

Fibre Systems can determine

A. Leaks via temperature change via sound produced

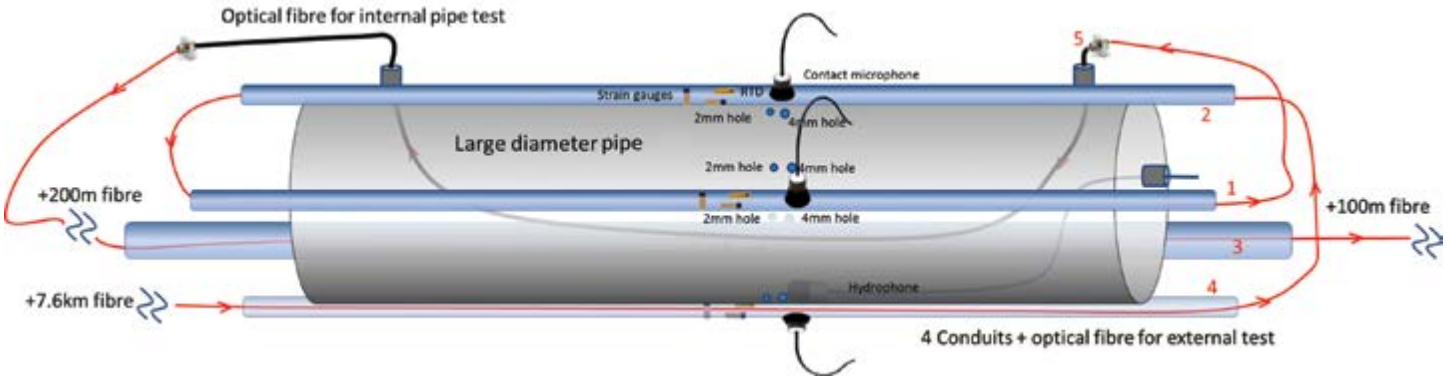
B. 3rd party intrusion

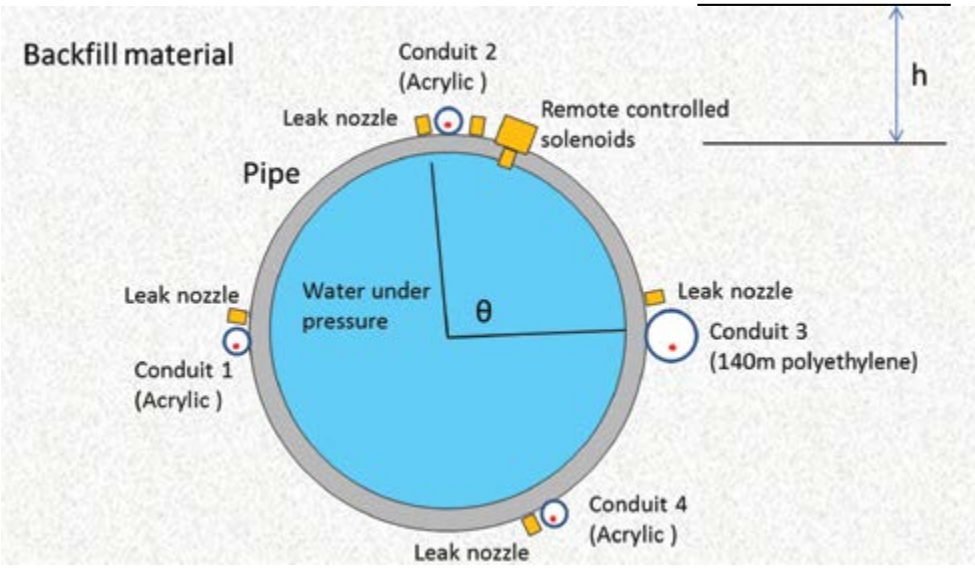
C. Stress / strain due to environment change



HAWK fibre optic sensor interrogation system

Test bed



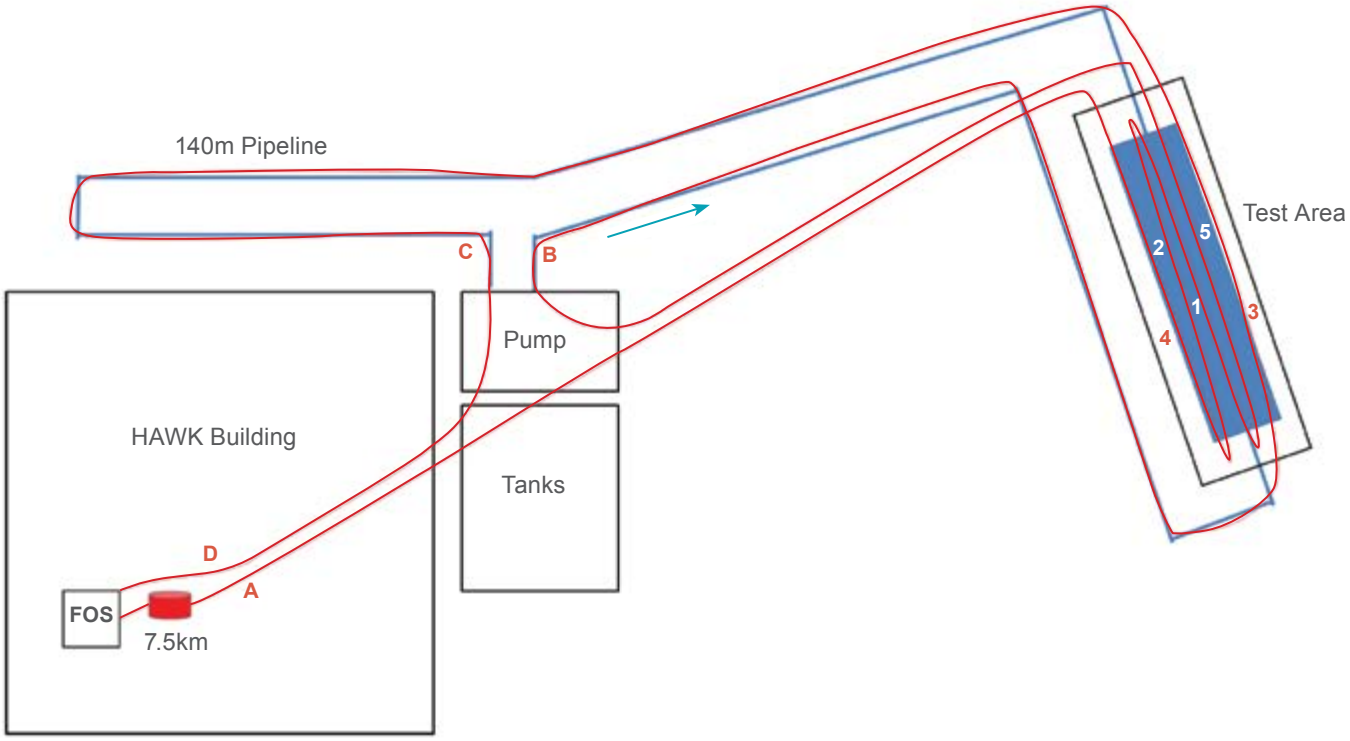


HAWK pipe test facility

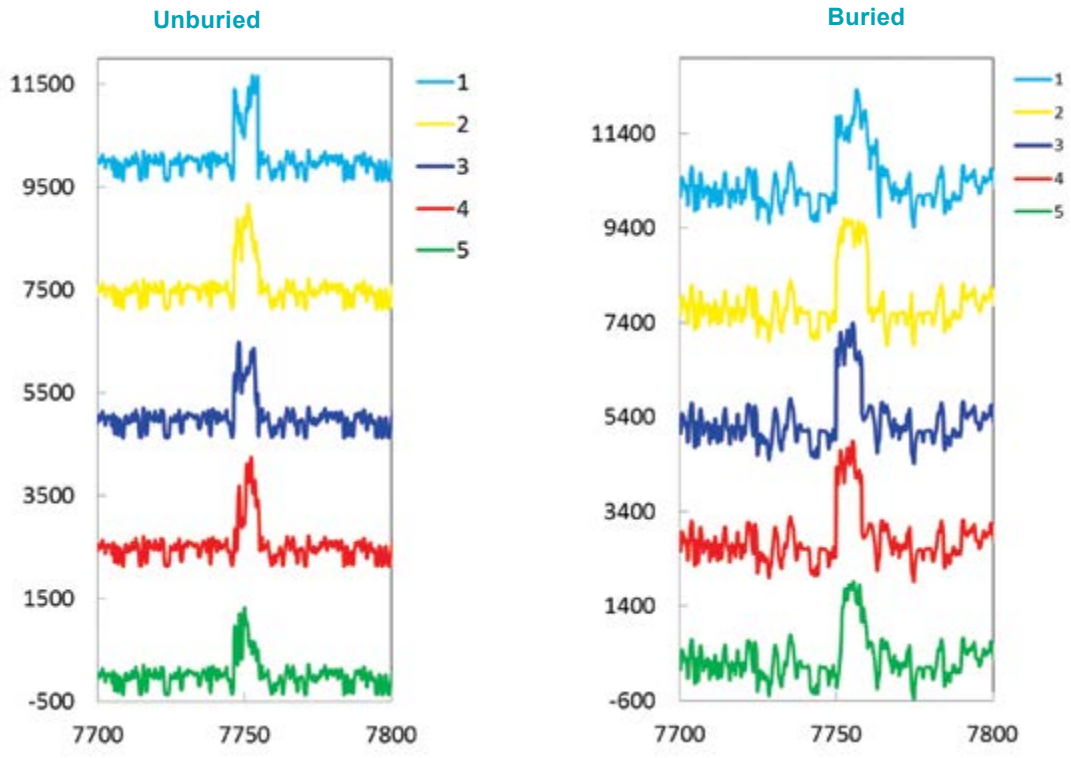
Opposite view during sensor installation

Buried under 0.8 crushed rock

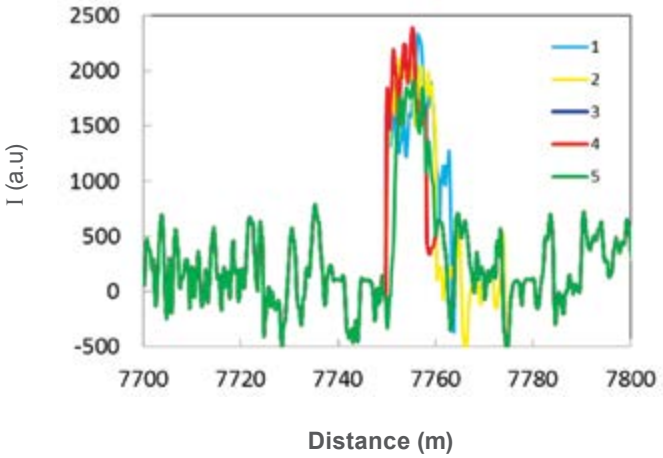
Optical fibre layout

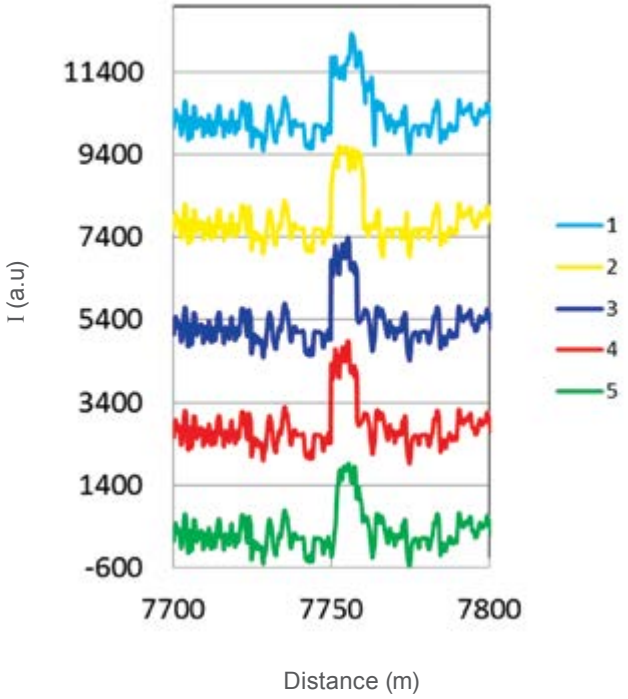


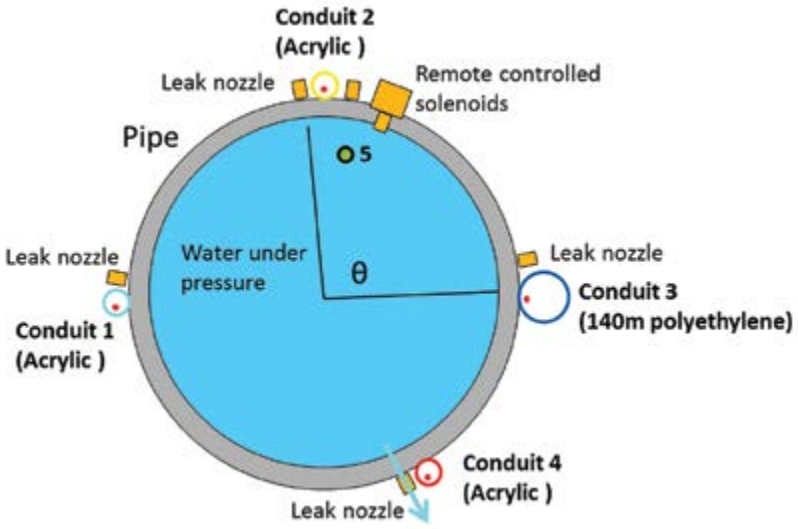
Sound detection of unburied and buried large water pipe



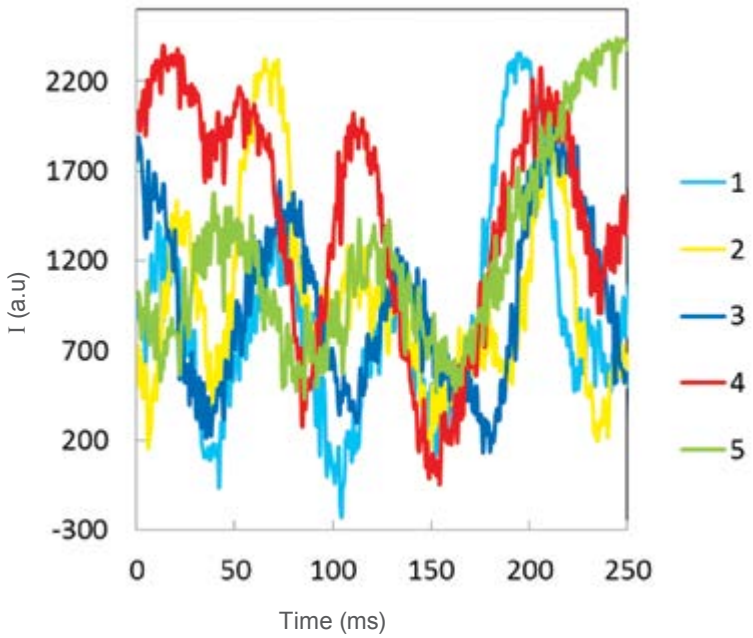
Detection and localizing the sound due to water leak at large water pipe buried 0.8 m



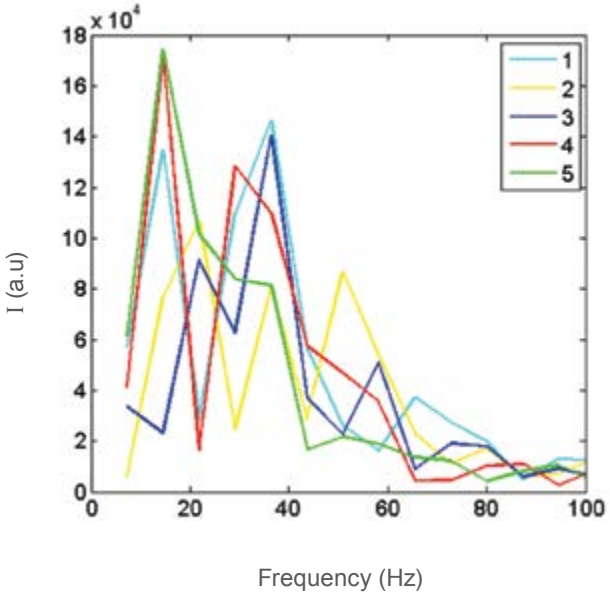




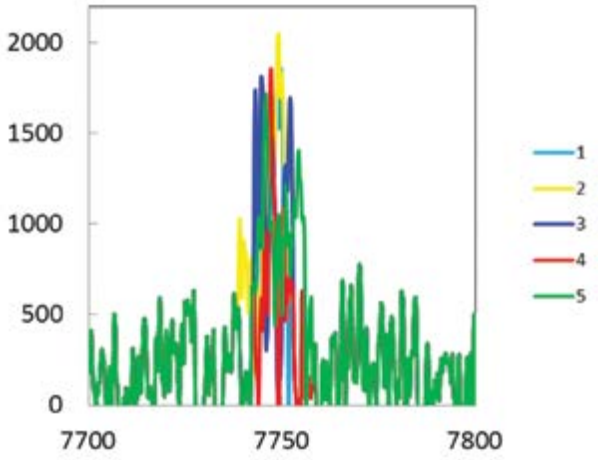
Waveform of sound due to leak of water

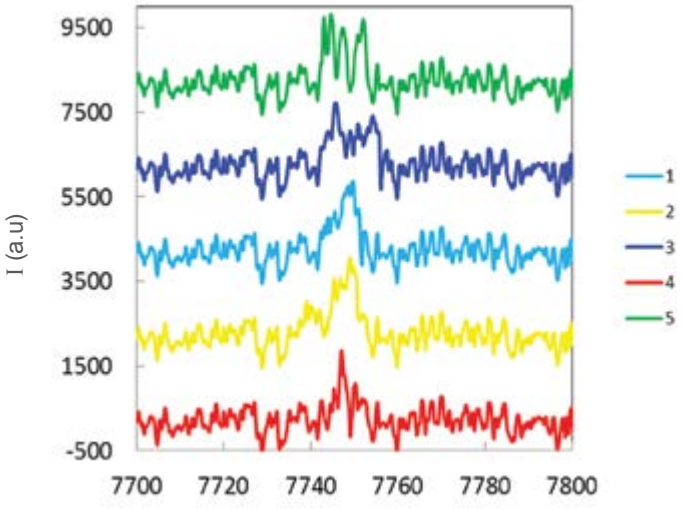


Spectrum

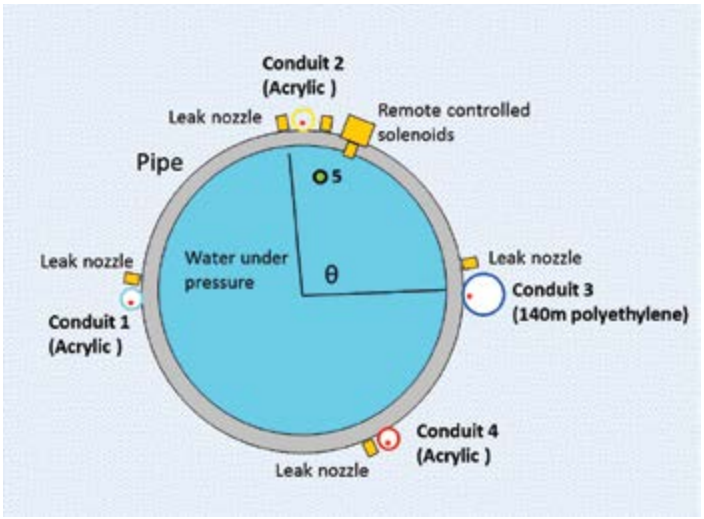


Detection and localizing the vibration due to third party intrusion at surface of buried pipe

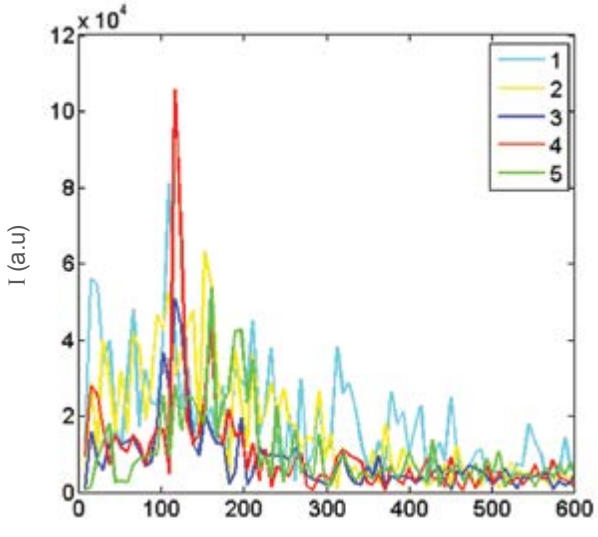




Distance (m)

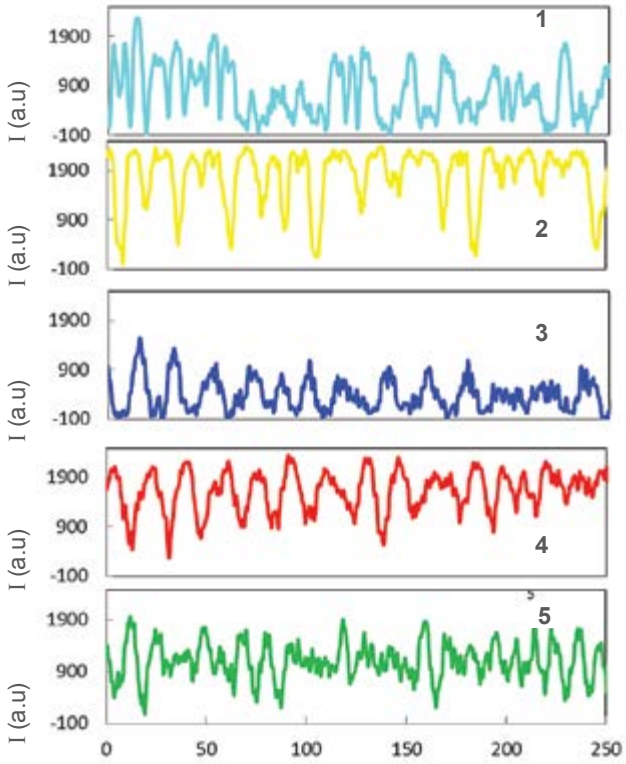


Spectrum



Frequency (Hz)

Vibration Waveform



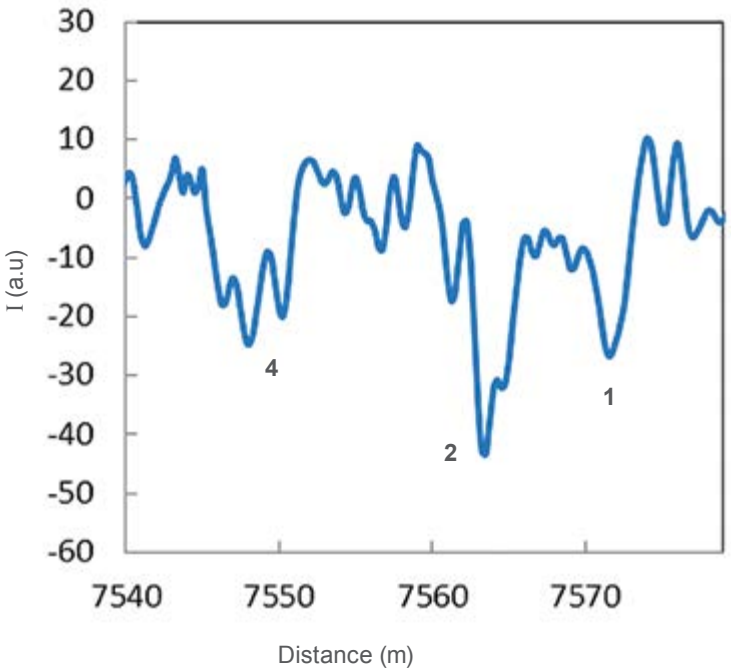
Time (ms)

Vibration due to third party intrusion at surface of buried pipe was detected by conduit 4,2,1, 3 and inside pipe fibre. Vibration waveform and spectrum were recorded.

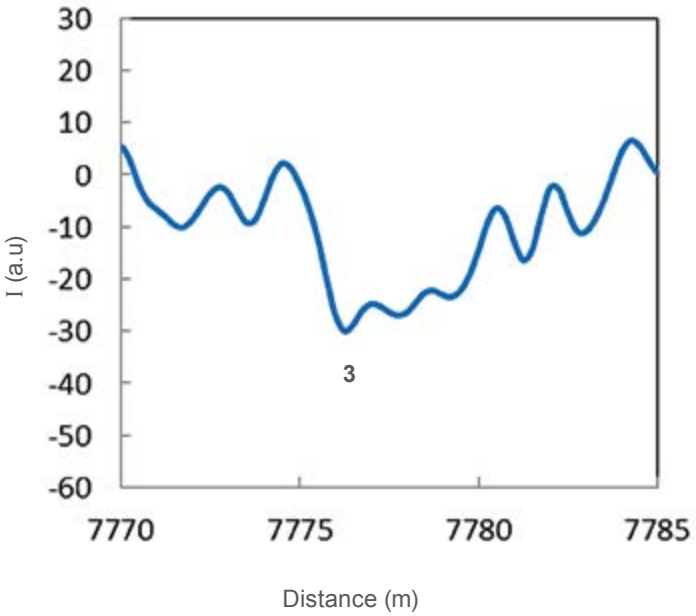
Detection and localizing the temperature change from water leak by ROTDR at large water pipe buried 0.8 m

Temperature change due to water leak is picked by ROTDR system.

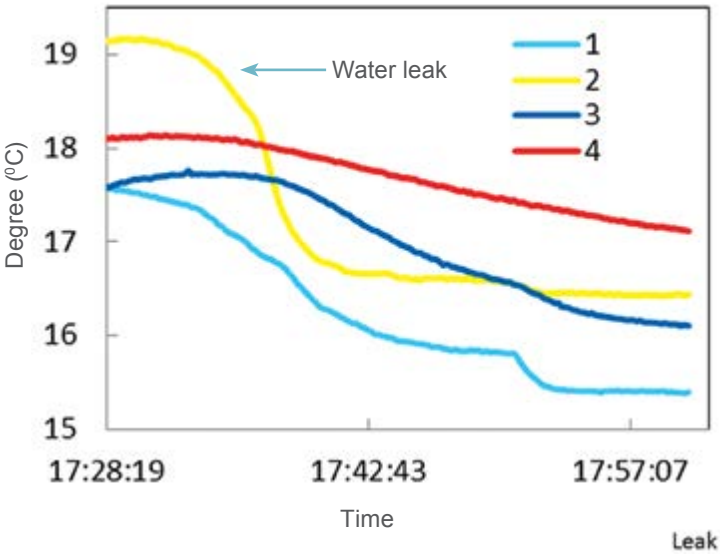
Fibre sensor



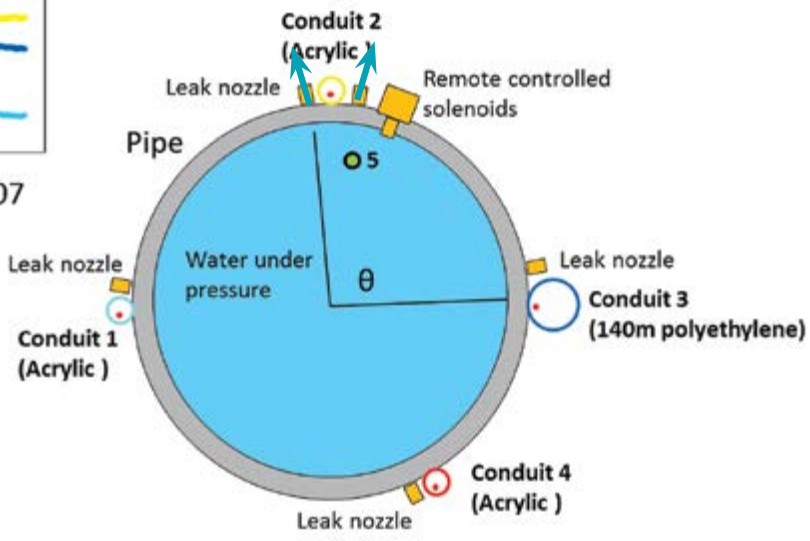
Fibre sensor



Conventional sensor



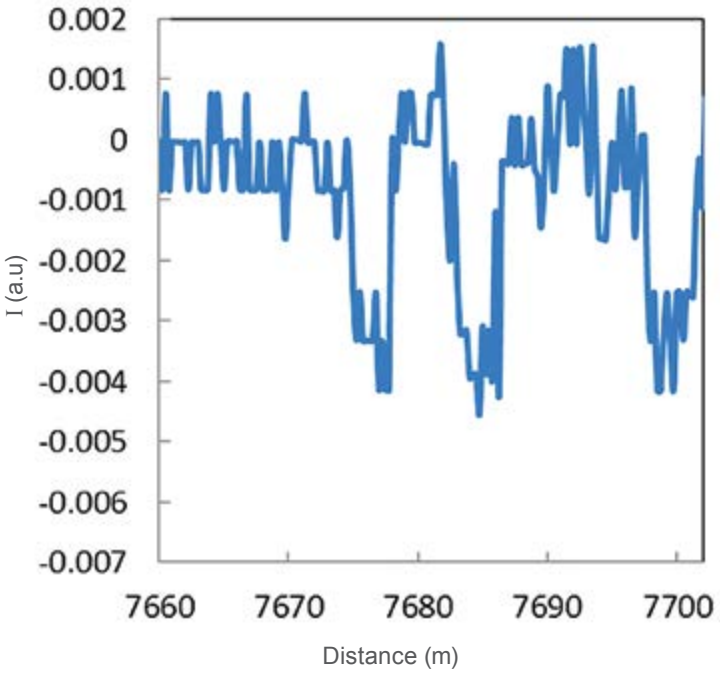
Water leak



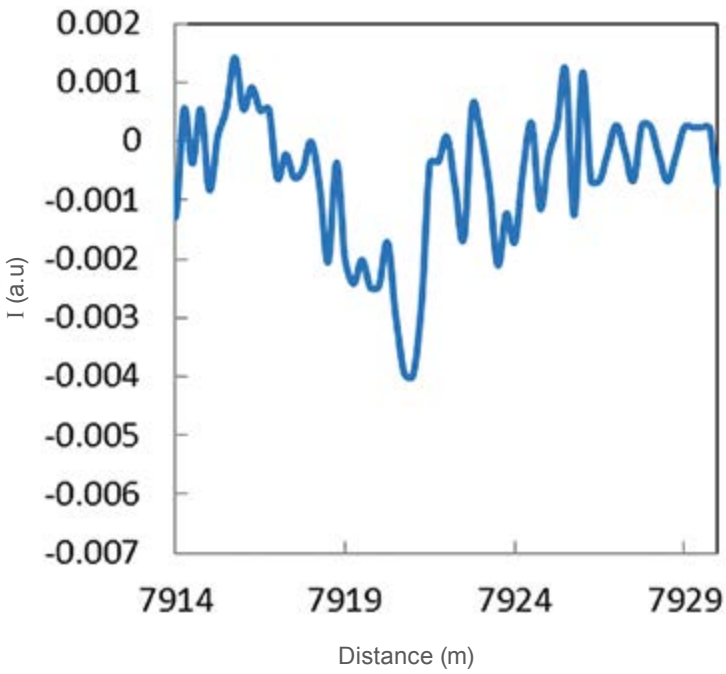
Detection and localizing the temperature change from water leak by BOTDA at large pipe buried 0.8 m

Temperature change due to water leak is picked by BOTDA system

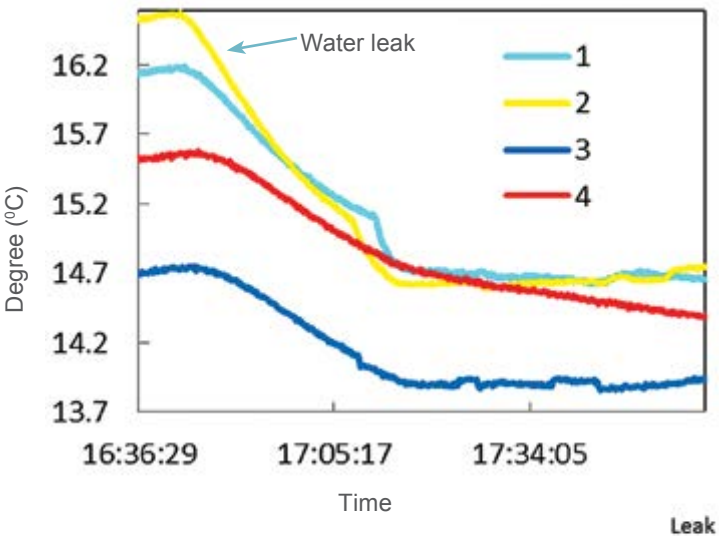
Fibre sensor



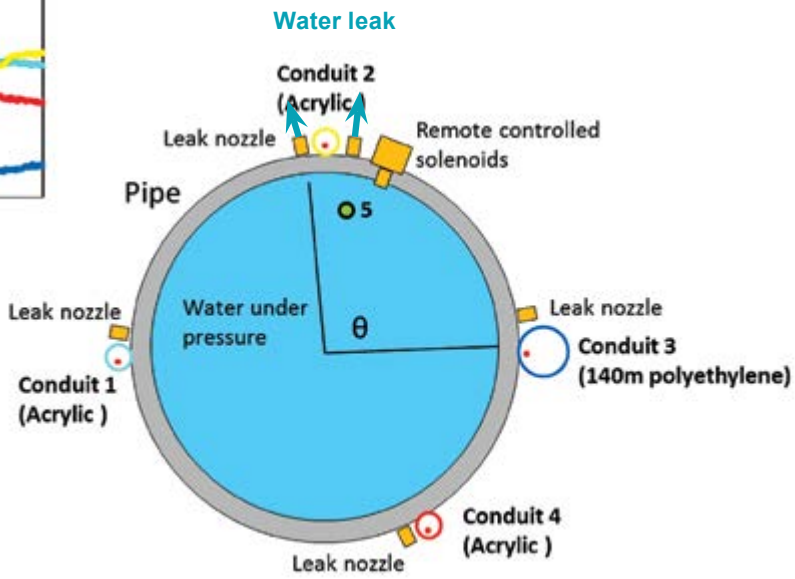
Fibre sensor



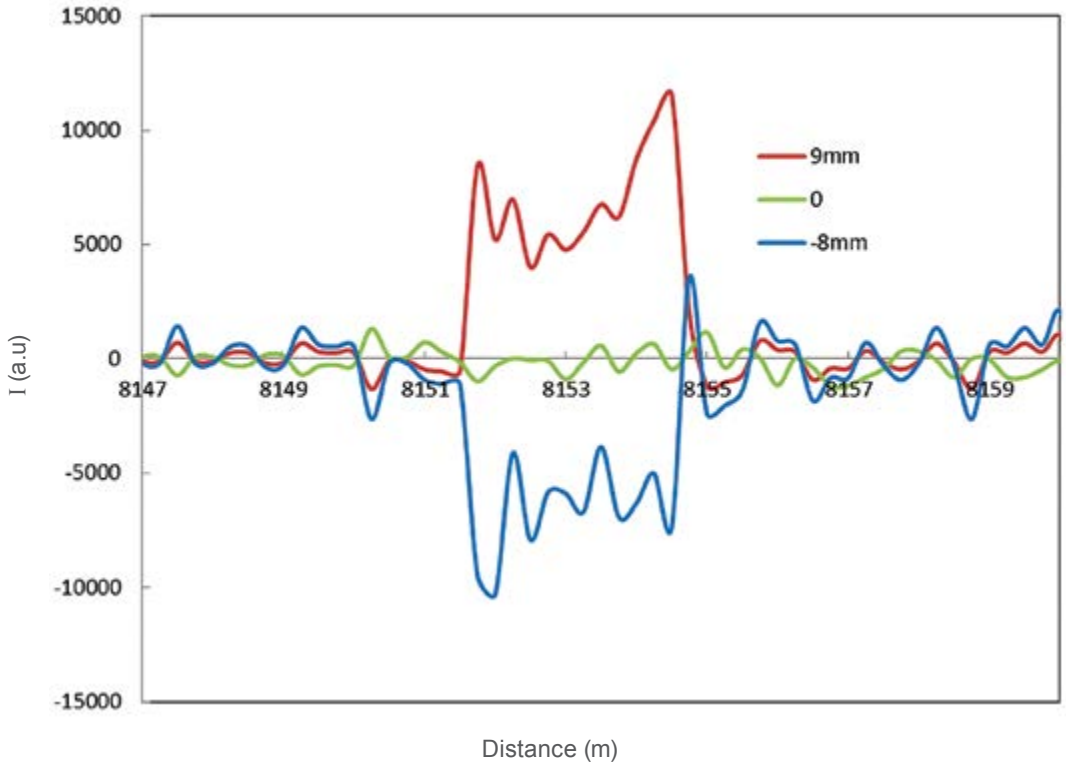
Conventional sensor



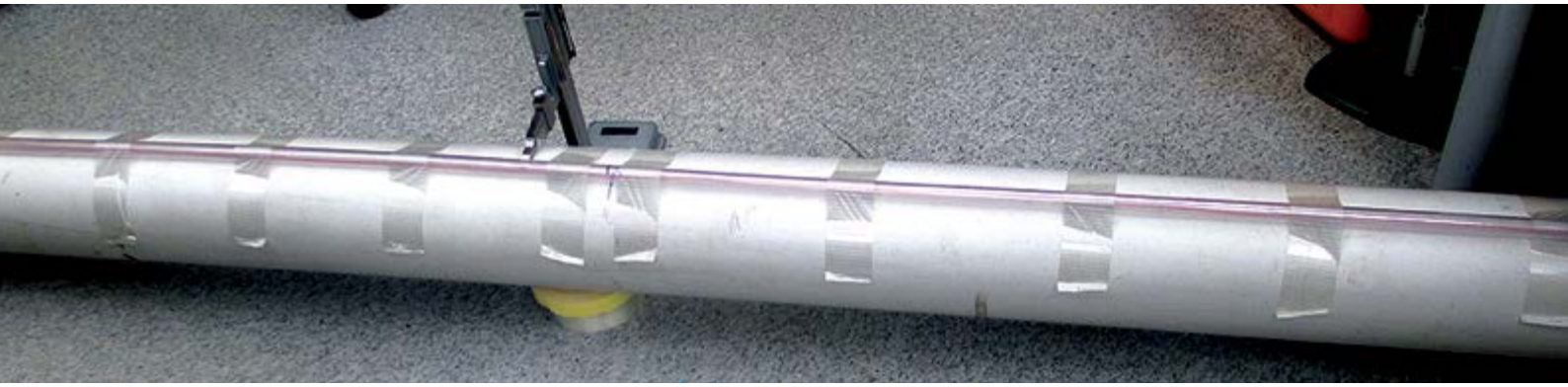
Water leak



Detection and localizing the strain change due to 5m conduit bending



Strain change due to conduit bending was detected and localized



Fibre Optic Monitoring Solutions

Oil & Gas / Water Pipelines

Features of Fibre Solutions

The HAWK Fibre System solution is a next generation monitoring system that has the following characteristics

Provides predictive analysis capabilities to allow better informed decisions to optimise the service life of the pipeline assets, this will include:

- Cable condition monitoring / aging characteristics.
- Stress, Strain and Pressures on the pipe.
- Ground movement.
- Unusual noise emanating either from the pipe or the surrounding environment.
- Parameters such as moisture for sensors located outside the pipe e.g. moisture from a leak can be inferred from a change in temperature data.
- Transfer of stress, pressure noise or movements at the pipe or near the pipe to the conduit where the fibre optic will respond to any of these stimuli.
- The technology solution uses 2 underlying technologies (**pipe external** and **internal monitoring systems**) and may be fitted using 3 possible options depending on the application (**externally** or **internally** on the pipe or via a **portable** solution).
- The pipe external monitoring system comprises:
    1. Coherent optical time-domain reflectometry (COTDR) system for detecting acoustic wave or sound using very cheap single mode fibre.
    2. Raman optical time-domain reflectometry (ROTDR) system for detecting temperature change along pipeline sharing the same single mode fibre with COTDR.
    3. Brillouin optical time-domain analyser (BOTDA) system for detecting strain along the pipeline, sharing same single mode fibre with COTDR and ROTDR.
- The optical signal is converted to the electrical domain using Optical Time Domain Reflectivity techniques for the fibre sensors.
- The combination of any two of the three signal types will provide a detailed analysis of pipeline condition and performance.
- Three parameters (sound, temperature and strain) will be detected along all positions of the pipeline to ensure any pipe movement and leakage is captured by the routine data collection.
- Distributed fibre sensing gives an infinite number of sensing positions for a variety of pipe system performance changes. Automated Alarms, and fault positions are accurately monitored for position and possible existing or new changes to the structure and leaks which may occur.

The combined approach will allow the collection of:

- Change in temperature data, from leaks.
- Change in sound from water leaks or third party intrusion.
- Change in stress/strain experienced due to pipe bending or loss of support.

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Additional product warranty and application guarantees upon request.
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