FUTURE PHOTONICS

MONITORING PIPELINES IN A MORE DIGITAL WORLD USING DISTRIBUTED ACOUSTIC SENSING

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In the post-COVID era, the world´s oil and gas sector is facing unprecedented challenges to meet social and political demands for a greater environmental responsibility in the face of extraordinary price pressures and capital constraints. There is, as a result, no shortage speculation about what the new normal will look like: from autonomous operations to extremely efficient, carbon neutral developments.

Constant innovation, continual development, permanent evolution, digital transformation all have an important role in paving new ways for the oil and gas industry. Transitioning to the digital world opens new opportunities and is driving oil and gas companies and pipeline operators through the digital transformation that is sweeping across all industrial sectors. Those who take advantage stand to gain the most.

In this scenario, pipelines of various diameters transport energy resources such as crude oil, refined petroleum, natural gas, biofuels, water as well as other fluids within facilities and across vast distances. Monitoring and mitigating pipeline incidents is a growing global concern. Pipeline leaks, theft, and damage can cost billions, both through loss of the product itself and loss of confidence by investors, insurance companies, and other underwriters. Whether from intentional interference such as pipeline theft or accidental damage, integrity breaches can cause severe financial, environmental, and reputational harm.

According to the U.S Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA), from 2010 - 2019, there were nearly 3000 serious pipeline incidents; US$50 000 or more in total volatile liquid releases of 5 bbls or other liquid releases of 50 bbls or more; which cost the industry over US$7 billion.

Traditional pipeline monitoring techniques include CCTV, aerial surveillance, ground radars and line walking, mass balance systems, pressure transients. However, these systems cannot feasibly monitor the whole length of the pipeline simultaneously – nor can they accurately determine where and why the threat is occurring. Pipeline Intrusion Detection Systems (PvIDS) have long played a part in pipeline monitoring – but their capabilities are limited.

Traditionally, PIDS rely on internally based systems that deploy computer

modelling methods, such as the aforementioned mass balance and real-time transient modelling (RTTM). However, these systems have long detection delays and very low sensitivity to small pipeline leaks or breaches. Given the volume of product that a pipeline carries, even the smallest delay in pipeline monitoring detection can have a vast impact.

Distributed Acoustic Systems has a mix of the best features to ensure the preventative and predictive maintenance necessary for these assets to operate with more efficiency while minimizing social and environmental impacts. The DAS technology is a tested, validated and field-proven solution that is available to help pipeline operators identify wat,er leaks, theft, vandalism, third-party interferences, earthquakes, ground movements, landslides and so on. For instance, DAS assists pipeline operators in their efforts to reduce product loss as it informs whether a threat is likely to be caused by human interference such as pipeline theft, or ROW (heavy machinery) interference, or a natural breach such as a burst line and allows them to immediately take action.

Since this advanced sensor uses algorithms to process vast amounts of data to identify discreet anomalies in the sound and vibration in pipelines at an early stage it can detect events in the pipeline potentially before performance is compromised. It uses artificial intelligence to detect and classify several types of events allowing a proper response to be taken immediately, rather than one-off inspections. It works by using already installed optical communication fibers as sensors, meaning that this technology eliminates the need to deploy new, dedicated, fiber-optic cables in order to increase surveillance 24/7/365 without false alarms. This system plays a vital role in ensuring the continuous operations and safe transport of energy resources around the globe with a long lifetime.

By offering deep learning in combination with the most recent breakthroughs in AI-based technology, **Future Photonics** offers the ideal solution to properly monitor pipelines at great speed and high accuracy. Distributed Acoustic Sensing along with other IoT-based techniques, are going to become the standard in monitoring infrastructure assets worldwide as the oil and gas industry drives toward a more digital and environmentally conscious future.