Fiber Optic Pipeline Monitoring Solution
Preventing and detecting leaks in real time
You go to great lengths to safely and reliably transport oil and gas to the market. And, although there have been several developments in pipeline monitoring technology, many systems have limitations that leave pipelines vulnerable to leakage, damage and theft.

Overcoming these limitations often results in the installation of multiple, cost-prohibitive systems to effectively monitor various leak scenarios. But, it doesn’t have to.

Instead of relying on computational assumptions, the OptaSense pipeline monitoring system transforms a standard fiber optic cable into a virtual sensor capable of detecting the physical characteristics of a leak, including changes in noise, temperature, pressure and ground strain—simultaneously and in real time. The integration of these four nodes into a single leak detection system not only provides improved sensitivity, it delivers the reliability required to identify and validate leaks faster and with more confidence.

With sensor systems, ensuring optimal pipeline coverage can add up. Once connected to OptaSense equipment (installed every 80km), this pipeline monitoring system is able to continuously monitor the entire pipeline and surrounding facilities by providing uninterrupted data updates continuously, across each 10 m of fiber. This means you can detect the presence and location of very small leaks in a matter of minutes, while protecting critical infrastructure from external threats that can lead to substantial damage and loss.

All systems are not created equally. Rely on a single pipeline monitoring solution that fortifies your overall integrity management program by ensuring threats to your pipeline are predicted and averted.

Using OptaSense® distributed acoustic sensing (DAS) technology, you can detect, locate and classify multiple threats in real time, along the full extent of your pipeline.

Where most systems fall short in performance, OptaSense raises the bar by delivering a system that detects smaller leaks faster and more reliably, while monitoring for third-party interference and other external pipeline threats in order to prevent leaks altogether.

Instead of requiring dedicated pressure sensors and high sampling rates, OptaSense® distributed acoustic sensing (DAS) technology eliminates the need for redundant systems and hardware, so you can invest in acquiring what matters most—the real-time information required for optimal pipeline management.

Fiber Optic System Advantages

- Faster, more sensitive threat detection and classification
- Rapid, more accurate threat location
- Smarter, more reliable alarms
- Consistent, more robust system performance

Advanced sensing
- Measures acoustics, temperature, pressure, strain and critical noise
- Eliminates conversion and computational errors
- Performs in transient, slack-line and multi-phase flow
- Monitors longer distances using thousands of distributed sensors
- Provides localization accuracy of ±10m

Flexibility
- Customize a system for your specific pipeline environment

Reduced installation costs
- Eliminates the need for redundant systems and hardware
Detect smaller leaks faster with superior sensitivity

Internal leak detection systems are one of the most commonly used methods to detect a leak. These systems use point sensors to track flow rates, as well as provide mathematical and statistical computations of pressure, temperature, and product characteristics. Although these systems are useful in identifying leaks, it takes longer to detect them, while small leaks may go completely undetected.

Where point sensors can lack in sensitivity, the OptaSense pipeline monitoring system offers a leak detection application that detects smaller leaks faster—allowing you to eradicate minor issues before they become major incidents. In fact, our fiber-based system can detect small leaks 10 times faster than internal systems—allowing you to detect a 0.1% leak size within a matter of minutes.

Locate leaks with increased accuracy

Another issue with many internal systems and sensors is their inability to identify the location of a leak. With internal systems, leaks are determined by analyzing discrepancies between predicted and measured values. For accurate computational modeling these systems require a large number of point sensors to monitor the extended range of a pipeline. Due to cost, sensors are only installed in increments along key areas of the pipeline, which limits their reliability.

Pipelines are susceptible to various external threats that can result in significant damage, or worse, a rupture. However, a majority of these incidents can be prevented.

In addition to leaks, the OptaSense pipeline monitoring system detects the external events that lead to pipeline damage, so you can respond to threats before incidents occur—which is critical to achieving zero spillage, pipeline availability and economic success.

Detect external interference

Offering third party interference monitoring and right of way detection, our system alerts pipeline operators to events that occur along the pipeline corridor, such as digging, vehicle movement and other large machinery, before contact with the pipe is made.

Utilizing the fiber optic network around remote facilities, the system can also detect threats and unwanted activity nearabove ground infrastructure, such as block valves, refineries and pump/compressor stations.

Protect pipeline infrastructure

Sabotage and theft are other threats that can significantly impact pipeline integrity, as well as an operator’s bottom line. Protecting pipelines in high-risk areas typically requires a separate leak detection and security monitoring program, but the OptaSense pipeline monitoring solution provides the sensitivity and reliability required to identify and validate incidents, such as illegal hot taps and vandalism, faster and at a significantly lower cost.

Using your existing fiber optic network, our security monitoring and theft prevention application will detect and locate suspicious activity, including trespassing on foot or motor vehicle, low flying aircrafts, digging, and gunfights, up to 100km from a single location. With this knowledge, you can identify unusual activity and take immediate action to prevent a large pipeline event.

By integrating leak detection, security monitoring and theft prevention into a single system, the OptaSense pipeline monitoring solution can do both.

Advances in pipeline monitoring and security systems have made it easier to identify and respond to threats in real time.

Reliable alarms

In many external acoustic systems, higher levels of background noise can trigger false alarms—in some cases dozens of alarms each hour—which make it harder to detect external interference. To ensure nuisance alarms are effectively minimized, the OptaSense pipeline monitoring system operates these activities over a short period of time to create an exact picture of normal events prone to that area.

Smart zones

For more dynamic thresholds, this system offers smart zones that provide the flexibility to customize alert settings for specific regional needs, such as terrains, roadways and rivers, at different times of the day. With this insight, you can distinguish normal pedestrians and motor vehicles from gunfights and other activities, allowing you to monitor individual or interactive threats, where and how often they occur, whether they are time-dependent and their potential of becoming a major issue.

Unfortunately, many systems leave you questioning the location of a leak, the time it took to detect it or whether the leak truly exists.

The OptaSense pipeline monitoring system eliminates the guesswork that compromises safe and reliable pipeline management by detecting the presence and location of both large and small leaks in real time, regardless of fluctuating pipeline conditions.

Track inline pigging devices

Another means to monitor the condition of a pipeline, as well as removing accumulated pipeline debris, is the use of an inline pigging device. Often times a pig can get stuck in long pipelines, making it difficult and expensive to locate—but not with the OptaSense inline pig tracking application.

By tracking the acoustic signature, our inline pig tracking application follows the progress of a pig throughout the pipeline network. As a pig passes through a given well line, the resulting pressure pulses propagate through the pipe. These pulses can be detected a considerable distance away, enabling operators to swiftly identify the location of a stalled pig.

Mitigate the risk of pipeline failure

Locate leaks with increased accuracy

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Rely on robust system performance

Today’s complex pipeline networks require robust systems that perform under changing fluid compositions, temperatures and pressures, which for many internal systems often result in computational errors and false alarms.

The OptaSense pipeline monitoring solution eliminates these issues by delivering a system that performs under transient, slack line, and multiphase flow conditions.

Even when critical pipeline infrastructure goes offline, this fiber-based system ensures continuous and reliable real-time event detection, classification and location.

Detecting a leak quickly and effectively can be limited by a systems level of sensitivity, accuracy, reliability and robustness.

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Advanced processing and algorithms

Activities or events that occur along a pipeline produce unique sounds and vibrations, which DAS can detect. Using advanced processing, these unique acoustics are analyzed to eliminate background noise and then converted into a high resolution visual. By applying advanced algorithms, these sounds and vibrations are deciphered to create specific alarms for a given event or sequence of events—allowing you to monitor individual or interactive threats, where and how often they occur, whether they are time-dependent and their potential of becoming a major issue.

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Smart zones

For more dynamic thresholds, this system offers smart zones that provide the flexibility to customize alert settings for specific regional needs, such as terrains, roadways and rivers, at different times of the day. With this insight, you can distinguish normal pedestrians and motor vehicle traffic from an unexpected vehicle unloading several people.

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Mitigate the risk of pipeline failure

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Pipeline expansion is accelerating around the world, as is the pressure to increase the safety and reliability of existing, aging infrastructure.

OptaSense can help you meet these demands cost-effectively by providing a custom-built solution designed to address the unique environment, logistics and challenges of your pipeline.

Detector applications are easily installed and interchangeable, and can be run as individual software programs or bundled together for an integrated solution.

The OptaSense pipeline monitoring solution offers a robust platform complemented by a comprehensive lineup of detector applications and multifunctional interfaces.

Detector applications

LEAK DETECTION
- Negative Pressure
- Over/Under
- Drop/Change
- Temperature Change

RIGHT OF WAY MONITORING
- Mechanical Digging
- Animal Digging
- Natural Activity
- General Activity

THEFT PREVENTION
- Negative Pressure
- Over/Under
- Temperature Change

THEFT DETECTION
- Mechanical Digging
- Animal Digging
- Natural Activity
- General Activity

FACILITY SECURITY
- Footprint Monitoring
- Mechanical Digging
- Natural Activity
- General Activity

GROUND MOVEMENT MONITORING
- Seismic Activity
- Drop/Change

IN-LINE PIG TRACKING
- Pig Location
- Speed

CONDITION MONITORING
- Testing

For a reliable and robust pipeline monitoring solution that detects, classifies and locates multiple threats in real time, contact your local representative or visit us online to learn more.

Ensure threats to your pipeline and critical infrastructure are predicted and averted with a solution that’s proven to perform.

By combining leak detection and security monitoring into a single system, OptaSense helps you keep oil, gas and other products where they belong—in the pipe.

Our pipeline monitoring solution provides decision-ready data that optimizes business decisions and operating costs by increasing operational efficiency, maximizing productivity and reducing risk.

In fact, with more than 15,000km of pipeline under contract in over 40 countries, our fiber optic monitoring solution is protecting some of the world’s most valuable assets.