

PIPELINE MONITORING

Distributed Fiber Optic Sensing
for Leak Detection & Third Party Interference Monitoring

AP Sensing: Your trusted partner for pipeline protection

AP Sensing is the **Distributed Temperature Sensing (DTS), Distributed Acoustic Sensing (DAS) and Distributed Temperature Strain Sensing (DTSS) solution provider for your pipeline needs.** Our products are used in a wide range of critical safety applications, such as oil and gas reservoir monitoring, special hazard fire detection and power cable monitoring.

AP Sensing was founded on the **heritage of HP/Agilent technologies**, the market leader in fiber optic test and measurement for over 35 years. With thousands of installations, our Distributed Fiber Optic Sensing (DFOS) technologies are known for their **outstanding quality, reliability and performance.**

With **our expertise in pipeline applications, project management** and well-engineered **solutions**, we are monitoring prestigious and challenging projects. Our capabilities go beyond fiber optic sensing. With our management software **SmartVision**, we can integrate other sensors and Leak Detection Systems (LDS) such as **Mass Balance and Negative Pressure Wave LDS**, providing a comprehensive view on critical infrastructure.



Leading the Way with Passion.

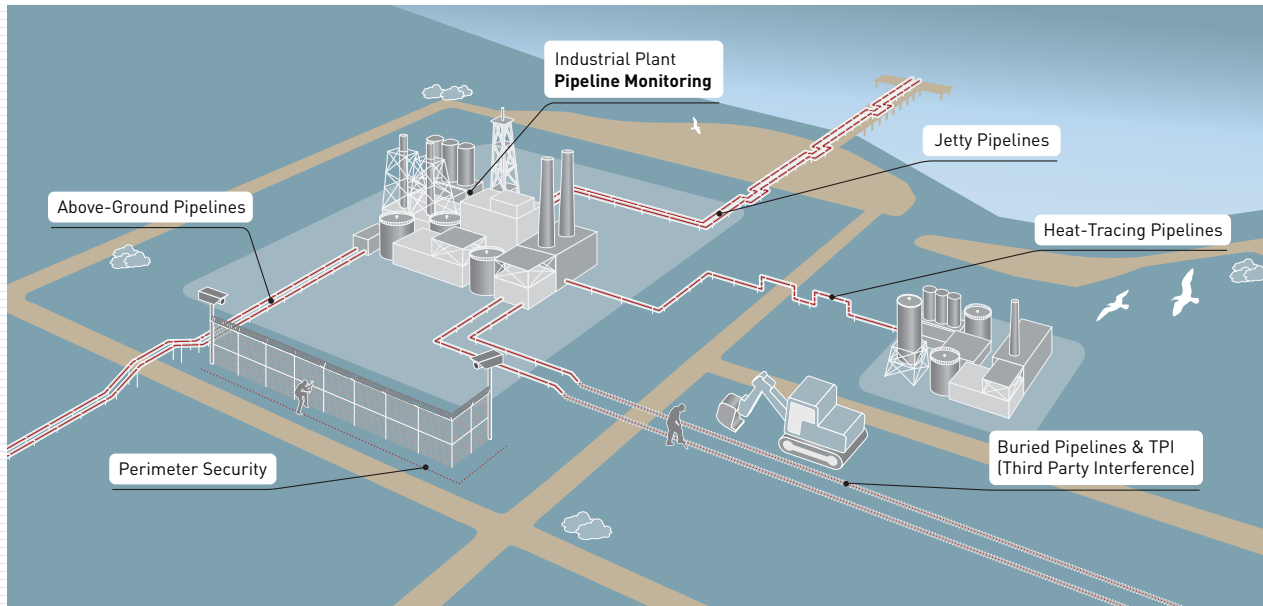
**Our expertise:
Solutions that fit
your needs**

Pipelines are long underground structures, subject to sophisticated **pipeline theft** actions, **malicious interference** or unauthorized construction work.

It is important for modern pipeline management to **ensure pipeline integrity, immediate leakage detection and risk mitigation**. AP Sensing's pipeline monitoring solution provides the capabilities to **monitor the entire downstream process 24/7**.

Our monitoring solutions are based on Distributed Fiber Optic Sensing, which is rapidly becoming **the detection method of choice** for pipeline protection and leak detection.

With our solution, pipeline operators can **convert** their existing **fiber optic telecommunication cables into sensing cables** or install new dedicated cables nearby to protect the pipelines.



DFOS advantages

DAS and DTS use fiber optic cables to monitor the entire pipeline

Real-time and accurate data acquisition along the entire optical sensor cable

The fiber is completely passive, immune to EMI and non-intrusive

Long measurement range, virtually maintenance-free for decades

DAS/DTS technologies are not influenced by the hydraulic conditions of the pipeline such as transients, slack flow or multiphase flow conditions

DFOS applications

FOLDS – Fiber Optic Leak Detection System for detection/location of gases, water, liquid hydrocarbons, LNG, LPG, and multiphase pipelines

Third Party Interference monitoring prevents damage or theft to the pipeline

Pipeline rupture and ignition detection

Temperature monitoring of pipe wall temperature for heated pipelines

Leak detection and slug tracking of multiphase lines

Pig tracking

AP Sensing's pipeline solution

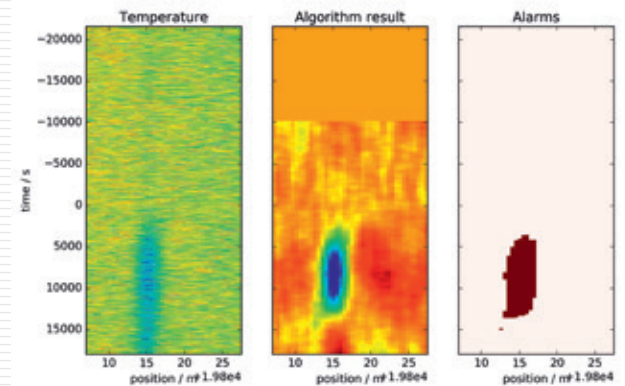
Our pipeline leak detection systems can be used singularly or in conjunction with internal leak detection methods. **The systems reduce response time** by providing fast leak alarm confirmation, accurately **detecting event locations** and helping to close false alarms caused by the internal leak detection system.

Thanks to the distributed measurement and the leading measurement range of AP Sensing's pipeline solution, leaks or intrusion events are precisely **detected and located along pipelines of hundreds of kilometers length.**

Third party threats to a pipeline – either accidental or intentional – are detected using distributed acoustic information and **leaks are detected** using a **unique combination** of distributed acoustic and temperature measurements.

"The SIL-2 (Safety Integrity Level) rating that AP Sensing has achieved on its DTS gives us the confidence that their solution is going to work as planned, day in and day out, in high-risk environments. Our LNG terminal operators sleep better at night knowing that our assets are protected and security standards are met."

Dr. Stephan Grosswig, GESO



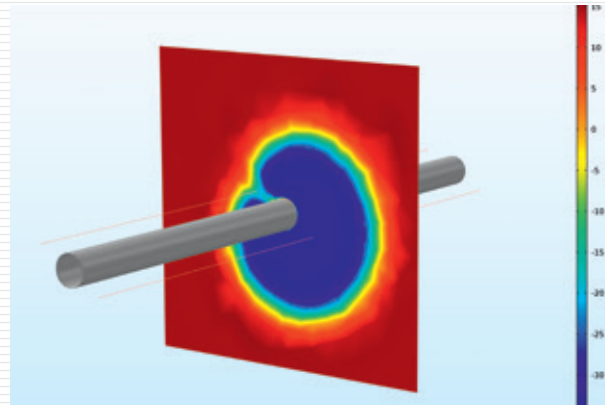
Detection and Positioning of a Leak Using SmartAlarm

Maximum safety and protection for your pipelines

AP Sensing's **pipeline monitoring** solution is based on two stand-alone technologies (DAS, DTS) that can be used together to provide redundancy and fast leak alarm confirmation.

DTS detects **pipeline leaks** by analyzing **temperature variations** on adjacent ground caused by the leak. The pipeline is divided into several zones to ensure **different tunings and alarm thresholds** can be applied.

DAS detects leaks by the **associated noise/vibration**, immediate **change in temperature (Distributed Temperature Gradient Sensing, DTGS)** and **Negative Pressure Wave (NPW)**. Furthermore, DAS tracks the progress of the position of **pigs or scrapers** in real time, showing the position of interactions with welds, liquid accumulation and other restrictions. The level of vibration due to localized restrictions can be monitored, helping to **identify waxing, liquid accumulation and slug formation**.



Finite Element Modeling Tool for Leak Detection Simulation

Instrument features

DTS – leak detection:

Detects pipeline leaks by analyzing temperature and precisely detecting and localizing any hot spot or cold spot.

DAS – leak detection:

Detects leaks by noise and vibrations generated by the leak

Detects change in temperature generated by the leak

Detects the Negative Pressure Wave generated by the onset of the leak

DAS – Third Party Intrusion:

Detects manual or mechanical digging, construction work and pipeline drilling

Detects dropped objects, anchor drop/drag, fishing trawl gear impact, and dredging works

Real-time pig tracking

Flow assurances

Reducing response time through excellent data presentation & management

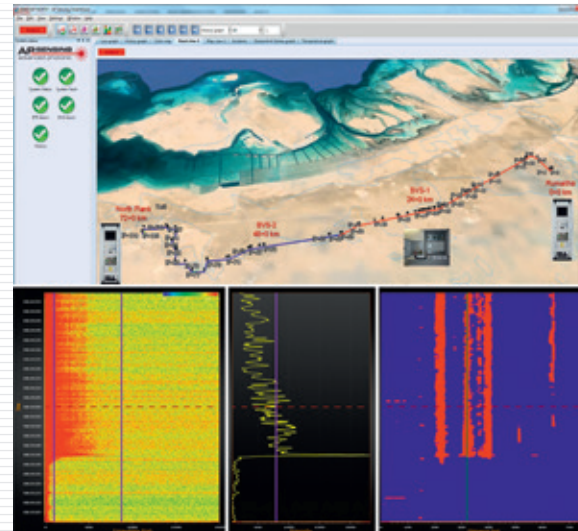
AP Sensing's **SmartVision management suite** shows the condition of your circuits at a glance, controlled by an easy-to-use graphical interface. It seamlessly **integrates many DAS, DTS, CCTV and other sensors** into a single platform. Superior event visualization **reduces the time** needed to reach informed decisions and further reduces response times by providing **accurate locations**.

SmartVision provides a **clear overview with an integrated map**, asset view, waterfall diagrams, and several analysis functions. A modern **client-server architecture** allows installation on virtualized IT networks and offers a comprehensive range of protocols for **interfacing with SCADA/DCS** systems.

Our proprietary **SmartAlarm technology** offers unique methods and algorithms to detect even small leaks. SmartAlarm **analyzes patterns** providing fast and dependable event classification and alarming.

"Knowing the technology and market, it is evident to me that AP Sensing is the forerunner in distributed optic sensing. Their solutions reflect a combination of experience and creativity. Experience comes from their HP/ Agilent heritage, the leader in test and measurement equipment, with decades of experience in developing and manufacturing extremely reliable and high-quality products. The creativity comes from their passion and commitment to solving real customer problems."

David Orr, Protex Systems



SmartVision Asset Visualization and Analysis of a Leak

SmartVision features

- Integrated management solution
- Asset visualization for complete plant overview 24/7
- Reporting and analysis capabilities
- Alarm management
- Central database
- Easy integration into control and management systems

Your complete solution provider

AP Sensing is your **long-term partner** for pipeline monitoring. **We listen to your challenges and strive to provide the best DFOS solution for your pipeline project.** Our complete offering fits your pipeline monitoring demands and protects your valuable assets.

AP Sensing provides a **complete turn-key package** that includes: system design built around proven components; customized software function and graphics as required; project management and engineering; installation and commissioning plus through-life support.

Our **international project teams** consist of multidisciplinary, highly skilled and passionate engineers and field support who combine their experience and expertise to deliver on our commitments.

Why choose AP Sensing?

Best measurement performance due to unique technologies such as code correlation and 2P squared technology

No drift and no recalibration; low maintenance costs thanks to features like patented single-receiver design

Large investments in innovation and product development guarantee high quality and a long product life

Market's most complete set of test reports and certifications

Support for project planning, design, installation, and commissioning

Solid project management and execution

A worldwide network of regional partners and experts



Temperature



Acoustic



Temperature and Strain

Our mission is to ensure your success

Drawing on our HP/Agilent heritage in optical testing, we have established ourselves as **the leading solution provider for Distributed Fiber Optic Sensing (DFOS)**.

We remain committed to delivering **well-designed, comprehensive solutions** to our customers.

We have worldwide offices **with highly qualified and motivated employees, and a network of expert regional partners**.

At AP Sensing we recognize that we can only be successful when our customers and partners are successful. Therefore, we take a **respectful and proactive role** in all our commitments.

With the industry's most complete set of tests and certifications, **AP Sensing helps you comply to relevant security standards** and ensures environmental and employee safety.

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Passion for Plants.

For every unit sold, AP Sensing plants 100 trees.

Product specification and descriptions in this document are subject to change without notice and are not binding to AP Sensing.

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