



WELL & RESERVOIR MONITORING

Distributed Fiber Optic Sensing
for Downhole Applications



**AP Sensing:
Your reliable partner
for well and
reservoir monitoring**

AP Sensing is the **Distributed Temperature Sensing (DTS), Distributed Acoustic Sensing (DAS)** and **Distributed Temperature Strain Sensing (DTSS)** solution provider for your various downhole applications. We provide global sales and service through a network of local offices and highly qualified partners. For more than a decade, our systems have been successfully deployed across a wide range of markets and regions. These include, among others, Oil and Gas (O&G) upstream applications and protection of critical infrastructures, such as pipelines, power cables, metros, train stations, road and rail tunnels. By constantly developing our instruments and having extensive experience in various industries, we ensure **accurate monitoring of your borehole**.

We develop our fiber optic sensing solutions based on **the tradition of HP/Agilent Technologies**, the world leader in optical test and measurement for **over 35 years**.

Building on HP/Agilent's processes and knowledge, we have established ourselves as **the leading solution provider for Distributed Fiber Optic Sensing (DFOS)** in a wide range of applications.

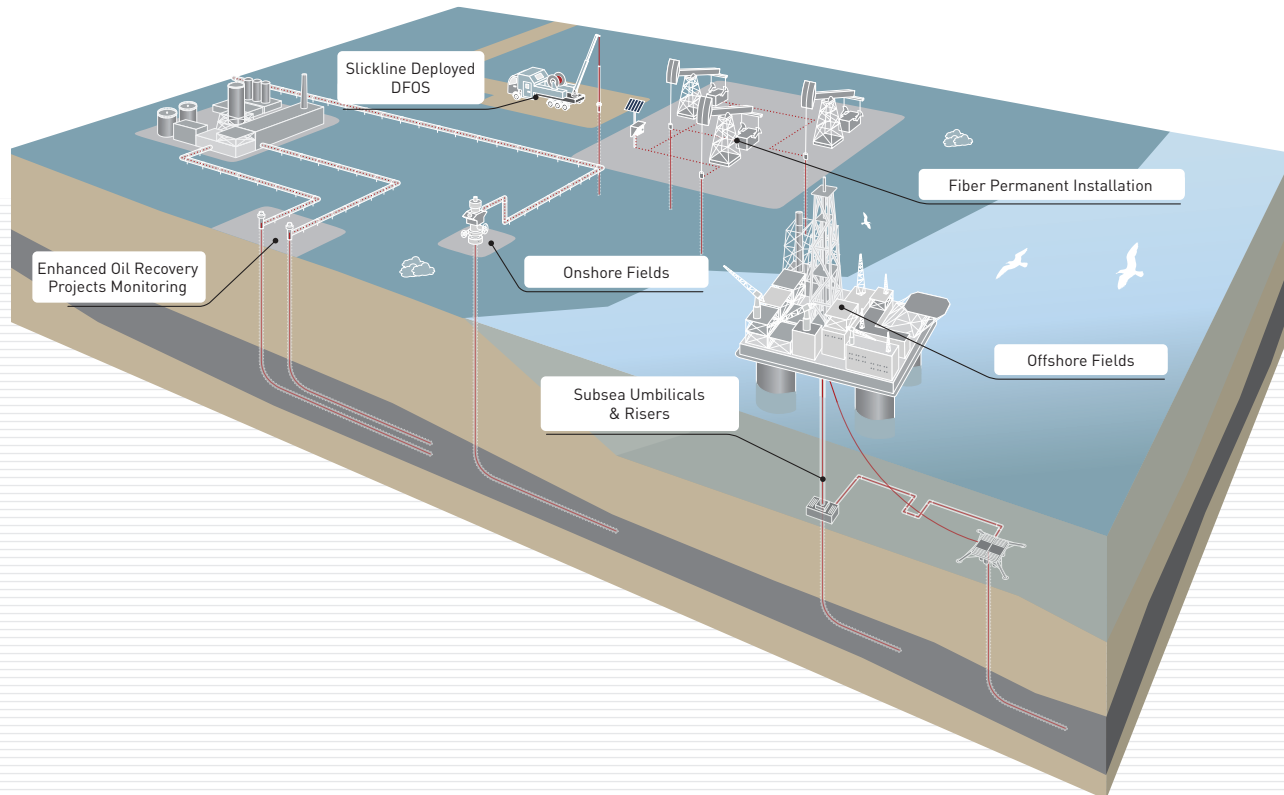


Leading the Way with Passion.

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

AP Sensing's DFOS technology is a well-established technology for various downhole applications. It provides many benefits such as the **ability to perform different measurement types (e. g. temperature, acoustic, strain)** using a single cable with multiple fibers. Additionally, it enables **simultaneous measurements along the entire length of the well and provides real-time data acquisition**. Our solution enables better reservoir understanding and proactive responses to possible safety issues while reducing environmental impact and operating time at the same time.

We offer gapless, 24/7 monitoring.



DFOS advantages

Continuous and simultaneous measurements along the entire well length

Ability to monitor properties in dynamics

Passive and robust sensor cable immune to EMI

Cost-effective solution

Ideal for both temporary and permanent deployment

Carbon footprint reduction

Application areas in O&G upstream sector

Well integrity and well equipment monitoring

Production monitoring

Hydraulic fracture monitoring

Enhanced oil recovery projects monitoring

Borehole seismic

Subsea umbilicals and risers

Carbon Capture and Storage (CCS)

AP Sensing's Solution for Well and Reservoir monitoring

Distributed Temperature Sensing: AP Sensing's DTS is based on the proven **Raman Optical Time Domain Reflectometry technology (R-OTDR)**. AP Sensing uses its **patented code correlation OTDR (CC-OTDR)** that allows utilization of low optical power. It eliminates any problems with laser degradation and enables worry-free, long-term measurement stability.

Distributed Acoustic Sensing: The AP Sensing's phase-based DAS system measures the acoustic vibrations on the fiber based on the principles of **Coherent Optical Time Domain Reflectometry (C-OTDR)**. The revolutionary **2P Squared technology** of DAS provides a true linear measurement of dynamic fiber length changes caused by strain from acoustic/vibration signals or temperature fluctuations.

Distributed Temperature Strain Sensing: AP Sensing's DTSS is based on the **Brillouin Optical Time-Domain Reflectometry (BOTDR)** technology. BOTDR operates with a large optical budget on a single-ended fiber, being less affected by changes in fiber attenuation. BOTDR enables extensive and accurate measurements of both temperature and strain within the sensing range.



Temperature



Acoustic



Temperature and Strain

Well integrity & well equipment monitoring

Whether a temporary or permanent installation, DFOS technology allows **immediate detection of well integrity issues.**

Production monitoring

DFOS technology **can be used to complement** conventional production logging tools (PLT) **or as a standalone method** for quantitative assessment of production profile.

Sand production control

By analyzing acoustic signals with DAS, it is possible to detect, localize, and quantify the amount of sand being produced. This helps to **optimize production, improve targeting of remedial actions, and minimize equipment damage.**

Hydraulic Fracturing

DFOS enables **monitoring, evaluation and optimization of hydraulic fracture operations.**

Carbon Capture & Storage

DFOS technology is an important part of a **Measurement, Monitoring and Verification Plan (MMV)** - one of the central parts of safe CCS operations, as it provides **real-time and continuous monitoring of the subsurface.**



DTS

Multimode and single mode instruments

Single /Dual-ended configurations

Longest measurement range of up to 70 km

Spatial resolution of 0.5 m, measurement time down to 1 sec

Modern, easy-to-use web interface for easy set-up and system configuration

DTS traces export in *.csv, *.witsml, *.las formats

DAS

The true, phase-based system allows for quantitative data interpretation

Configurable gauge length

Leading performance with standard fiber without additional amplification

Performance tests based on SEAFOM recommendations

Modular edge computing for real-time process optimization

PRODML data format output

AP Sensing's leadership in quality and innovation

AP Sensing has **the industry's lowest failure rate**. Aside from over 35 years of HP/Agilent's optical test leadership, we are passionate about continuously improving our fiber optic solutions to help you meet your day-to-day challenges.

Quality and performance are the drivers for our innovation. Unique technologies such as our single receiver design, Code Correlation Concept, and 2P Squared technology enable us to offer you Distributed Fiber Optic Sensing solutions with world-leading precision and range as well as long-term measurement stability.

All instruments run on **proven operating systems**, which are extremely stable and secure.

We continuously develop our solutions to **maximize the real-time value of data and make the system configuration process easier**.

Instrument Features

Proven field reliability

Industry's lowest maintenance and warranty costs

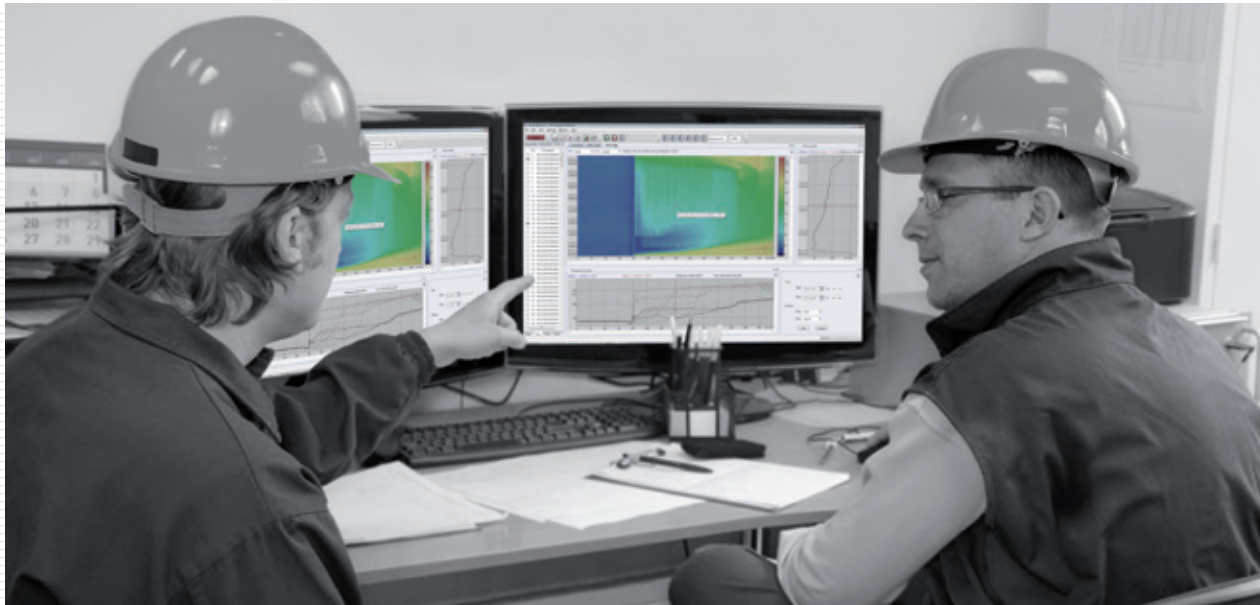
Outdoor/rugged/cost-effective/reliable technology

Wide instrument temperature operating range from 0 °C to 50 °C for DAS and from -10 °C to 60 °C for DTS

Eye-safe laser

ATEX certified

Quality and reliability



Your complete DFOS solutions provider

AP Sensing is your long-term partner. **We listen to your challenges and strive to provide the best Distributed Fiber Optic solution for your application.** AP Sensing's instruments use a **low-power laser** to ensure a maximum lifetime and safe handling under all conditions. These instruments have undergone **extensive testing and obtained the certifications required to meet the demands of your industry.**

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

Our DTS and DAS data formats conform to the standard formats used in the O&G industry. Thus, our data can be easily analyzed using any software that is available in the market.

We cooperate with independent O&G upstream market-leading DFOS interpretation software providers to ensure you receive all valuable information from the DFOS systems.

Why choose AP Sensing?

Best measurement performance due to unique technologies such as Code Correlation and 2P Squared

Proven field reliability with the industry's lowest maintenance and warranty costs

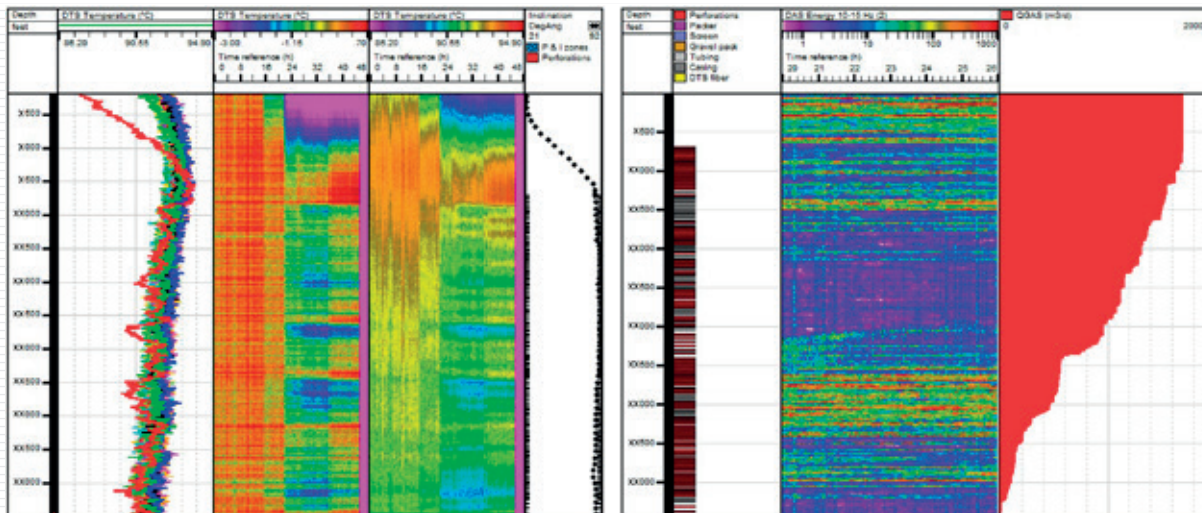
Industry-leading vibration and shock robustness

Low-power laser for safe use and longest production life

Broad experience in various critical infrastructure monitoring projects

Outstanding quality, system ruggedness and ease of use

Data output compatibility with common DTS and DAS data interpretation software



*Courtesy of ISP

DTS data in the reservoir section

DAS data in the reservoir section and quantitative interpretation results

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 with all relevant security standards** and ensures environmental and employee safety.

Contact us for more information!

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Passion for Plants.

For every unit sold, AP Sensing plants 100 trees.

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