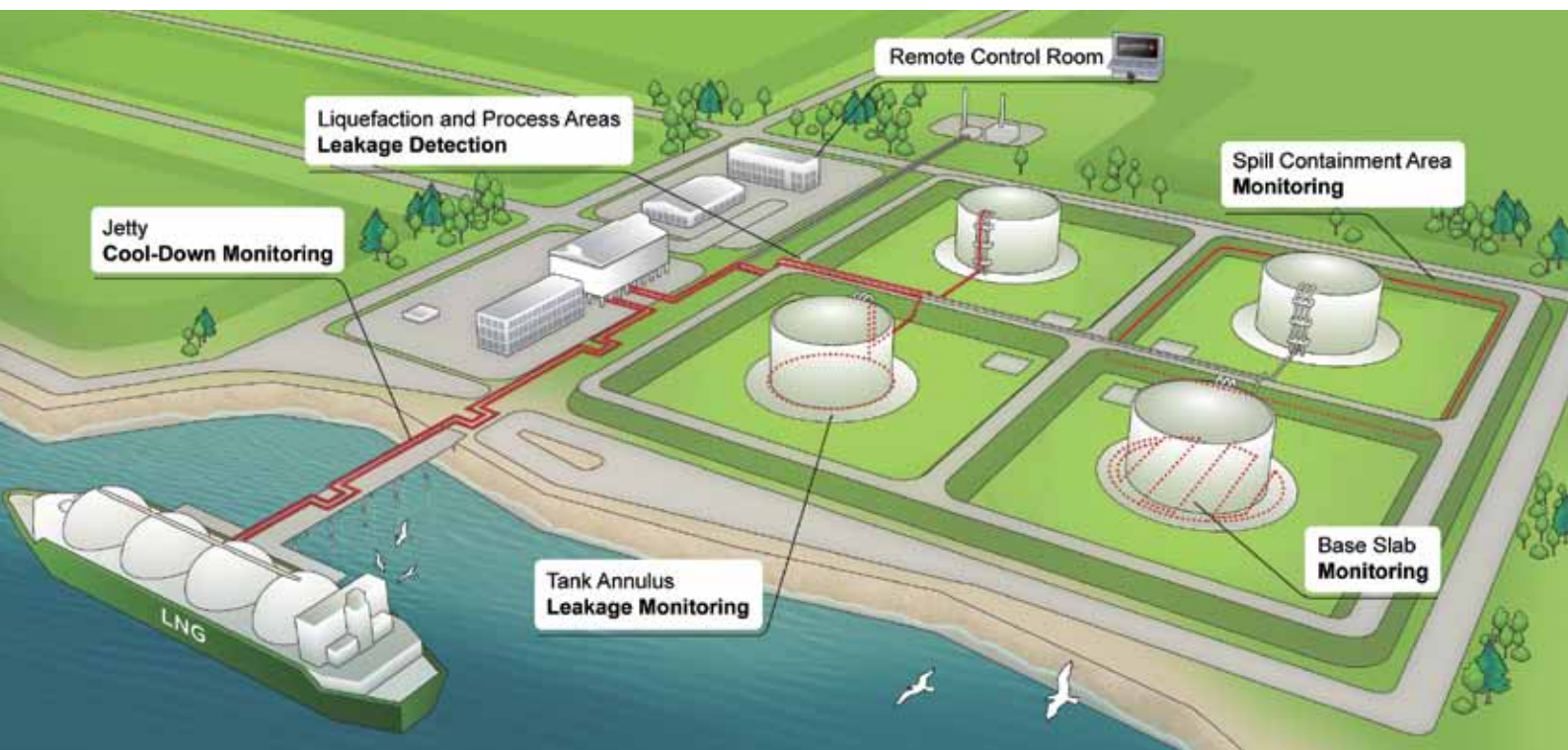




LNG Monitoring

Fiber-Optic Leakage Detection System

- Pipeline leakage detection
- Regasification and liquefaction monitoring
- Tank annulus and base slab monitoring
- Spill containment control



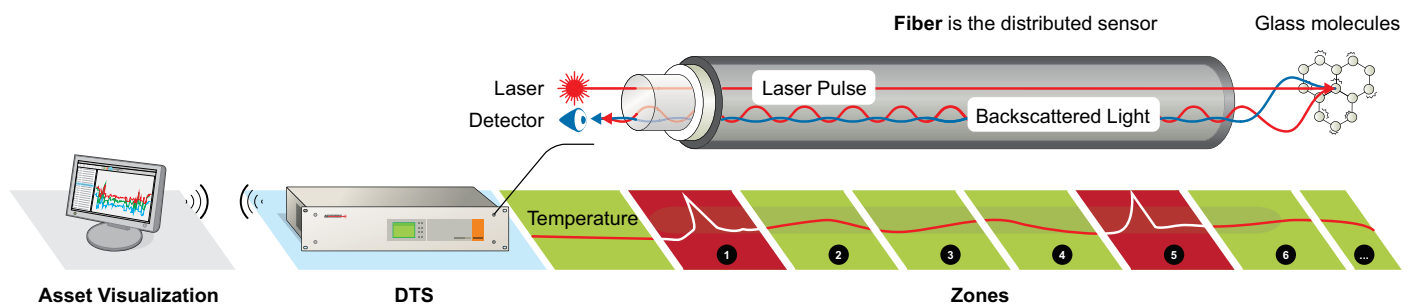
AP Sensing: Your trusted partner for LNG monitoring

AP Sensing is your global solution provider for the DTS (distributed temperature sensing) market. The heart of our solution – based on 25 years of experience as the leader in optical test – is a unique and proven solution for precise, around the clock temperature monitoring.

A passive optical fiber is the temperature sensor, and lets you monitor precise temperature profiles along the fiber – in environments where other solutions are unable to deliver the performance you need.

Through close cooperation with our worldwide customer base, we continuously optimize our solution. The result is not just robust and reliable solutions, but a relation built on trust and an expert who is there for you with post-sales training and support.

We work with established regional partners around the globe – their local competence ensures that all details of a complex project are planned for in advance and executed on time and within budget. Take advantage of a broad network of optical and system management expertise, and enjoy the peace of mind that comes with reliable asset protection.



DTS: A word about the technology

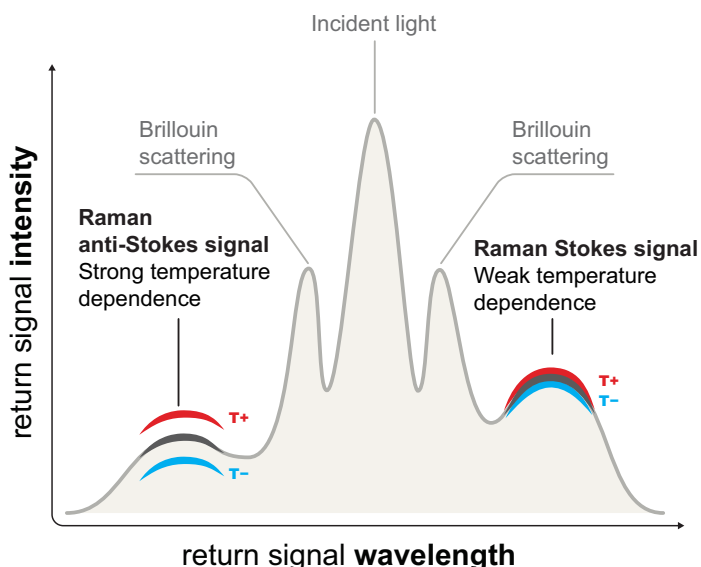
Imagine a temperature monitoring solution several kilometers long with thousands of measurement points that provide continuous monitoring along the length of the sensor cable. Imagine measurements down to one-half meter spatial resolution

with highly accurate sensitivity – within temperature ranges that are perfectly suited for pipeline environments.

Our solution is based on the quantum mechanical RAMAN effect combined with our patented code-correlation measurements. A laser pulse propagating through the fiber results in back-scattered light returning to the transmission end, where it can be analyzed and the temperature measured.

The purely passive optical fiber is installed in areas that are usually difficult to access, and provides maintenance-free operation for decades.

It is the sum total of our technology – sensor cables, asset visualization software, ease of integration into your own site monitoring system -- that ultimately ensures worry-free permanent monitoring.



AP Sensing's DTS and LNG infrastructure

Fiber-optic DTS technology is uniquely suited to a variety of monitoring tasks within an LNG terminal and is recommended for spillage detection in section 13.4 of EN 1473:2007-06. By making use of optical sensing probes, our system is non-corrosive and intrinsically safe. It accurately measures temperature over large distances and is suitable

for operation in cryogenic conditions. Because of the long measurement reach, the optoelectronic DTS instrument, with its electrical hardware, can be located in a remote control room. This simplifies compliance with safety requirements and ensures efficient communication links with other terminal data systems.

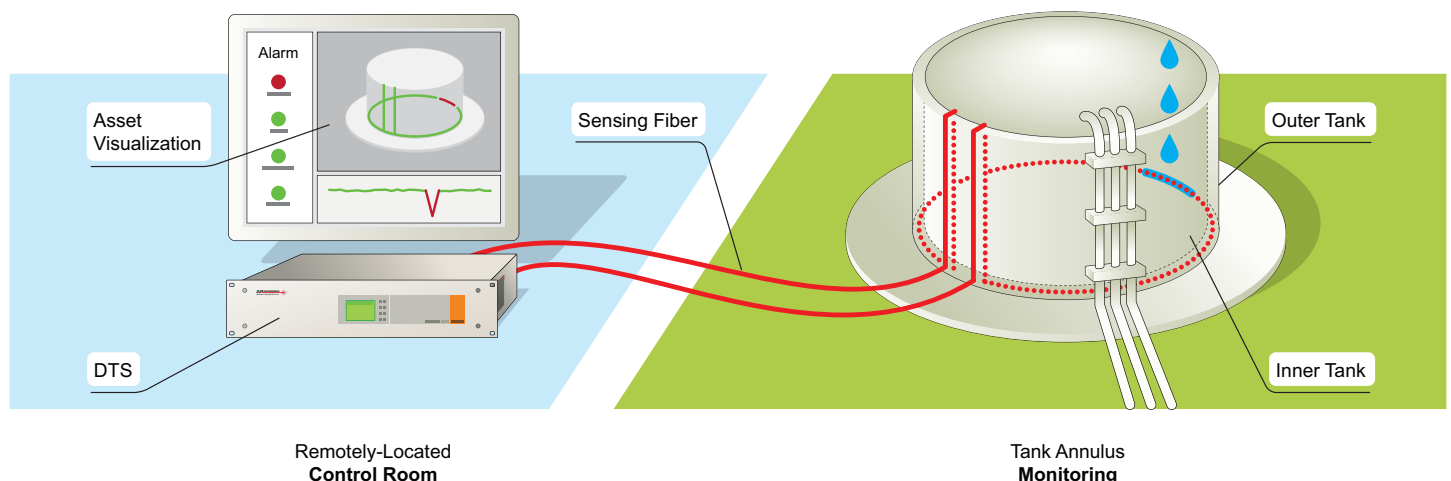


Tank leak detection

The DTS system locates leaks in the internal tank. The sensor fiber is deployed in the annulus between the two tank walls during tank construction. If a leak occurs, cryogenic fluid comes in contact with the

sensing fiber lying in the annulus space. Due to the low temperature of the fluid, the DTS system rapidly identifies even very small leaks.

- **ATEX certification down to Zone 0**
- **SIL-2 assessed by TÜV-recognized consultants**
- **Proven field reliability with industry's lowest maintenance and warranty costs.**
- **Asset visualization software for complete plant overview 24/7**
- **Ease of integration with existing site monitoring solutions**
- **Highest reliability throughout the entire operating temperature range**
- **Extreme operating temperature ranges**
- **Lowest laser output power – inherently safe in case of fiber breaks**

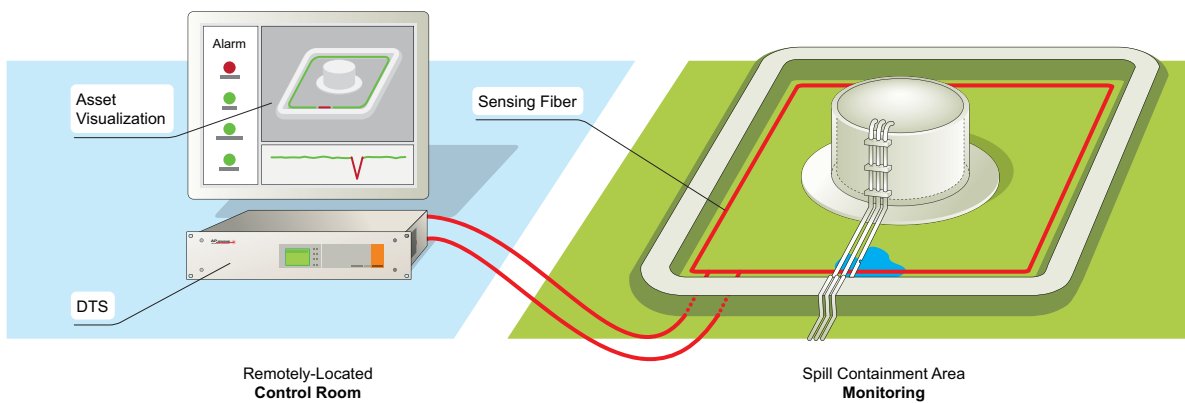
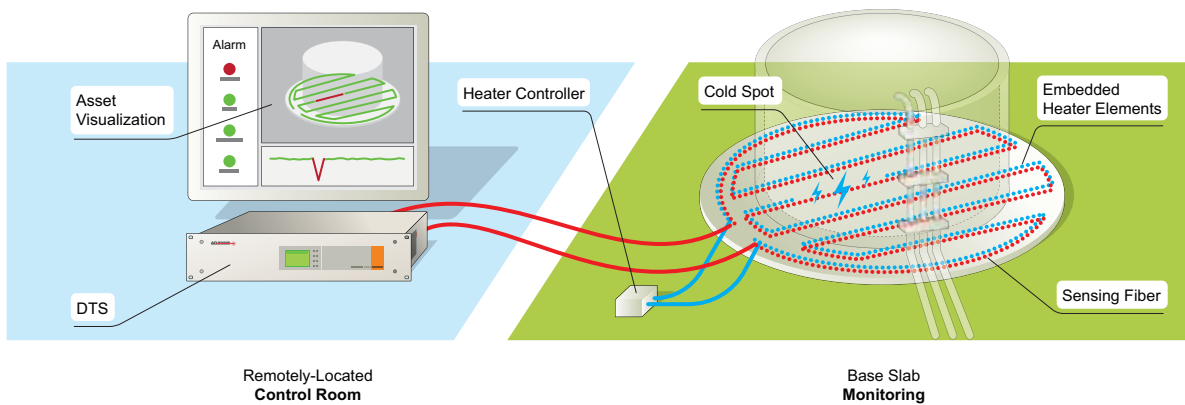




Base slab monitoring

The DTS monitors the entire pad area and heating system in real-time down to one-half meter spatial resolution. The sensor cable is deployed in the heating element conduit within the pad, and provides temperature data every half meter along its path.

In addition to the monitoring functionality, the temperature data also minimizes the power consumption. By identifying hot and cold spots, heating efficiency is improved. Alarms and system warnings are typically set for both abnormally high and low temperatures.



Spill containment areas

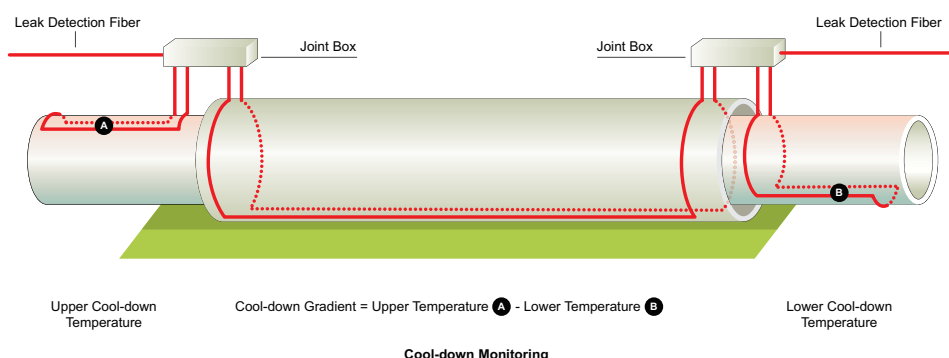
Cryogenic fluid is quickly detected by routing DTS sensor cable around the perimeter of the spill containment areas. When leaking material reaches the

containment areas, the temperature decreases, triggering an alarm. The system reports the precise alarm location.

Pipeline monitoring

From the jetty to the process areas and on to the tanks: the AP Sensing DTS solution provides thermal gradient information during cool down – ensuring that pipe stress is kept within specified operating limits. Also, it identifies pipe leak points and possible insulation problems that cannot be seen by a visual examination.

Accurate temperature information can be generated in ten second intervals providing rapid feedback for thermally induced pipe stress during cool down.



Ease of integration and site overview

AP Sensing's DTS solution can be fully integrated into the site monitoring and control system. This becomes important when the DTS is located some distance

from the main control room, for example, an ATEX wall-mounted device located near a tank, or a rack-based system in the jetty control room.



A range of industry standard communication protocols are available to facilitate this integration, including:

- Modbus TCP, RTU, ASCII
- IEC 60870-5-104
- OPC
- LabView
- ASCII File
- An open and fully documented SCPI protocol

In addition to these protocols, we have experience implementing many different types of communication:

- TCP/IP/Ethernet
- Serial interfaces (RS232, RS485, RS422)
- Relay contacts
- Analogue input/output
- Wireless modem
- Radio link
- Satellite
- GSM Modem
- USB – direct link to PC or laptop

The AP Sensing engineering team can also assist with custom communications if required.



AP Sensing's leadership in quality is based on intelligent design, proven components and decades of experience

The instrument design is based on a low power semiconductor laser with the lowest optical output power (Laser Class 1M) for a maximum product lifetime. Our proprietary code correlation concept provides the longest measurement range on the market.

Additionally, our DTS solution has a patented single receiver design that ensures long lasting measurement stability by eliminating drift effects associated with dual receiver concepts. Our unique design avoids the need for system recalibration.

Because it operates with the lowest optical output power, our DTS system is eye-safe and certified for ATEX Zone 0. Unlike other DTS instruments, it causes no harm in case of a fiber break, and it can be deployed in explosive atmospheric areas without additional safety measures.



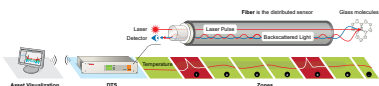
AP Sensing's advantages at a glance

AP Sensing's DTS solution fits your LNG monitoring demands and gives your plant operators peace of mind – your valuable assets remain protected!



Our experience

From project planning and management, to commissioning and ongoing service and support: your complete solution provider from a single source.



Fiber optic sensing technology

Real-time, 24/7 monitoring for fast leak detection.



Certifications

ideally suited to LNG

Plant safety and security are assured and all compliance requirements are met.



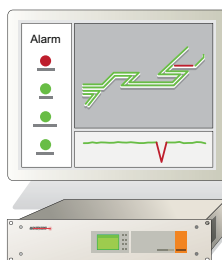
Integrated software, a real-time operating system and integrated alarming

No viruses, no blue screens, and no dependency on network stability.



Sensor cables that fit your needs

Our portfolio is specifically suited to pipeline applications, including steel sheathing and operating temperature ranges from -196 °C to +300 °C.



Intelligent definition of alarm and zone parameters

Efficient tracking of temperature gradients and use of heating systems.



The most qualified and dependable DTS solution

Stringent testing and decades of experience ensure a long and maintenance-free product life.

An intelligent instrument design with quality components, configured for your requirements:

- Overall system MTBF value is 33 years
- Semiconductor laser: 60 years at used pulse method
- Switch: tested for 1000 million cycles, the equivalent of hundreds of years
- Genuine dual end operating mode – two single measurements result in one automatically calibrated temperature profile.
- Long term measurement stability due to our unique single receiver design.



AP Sensing certifications ensure your compliance and safety!

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

ATEX Certification down to Zone 0

Ensures that our sensor cable and laser controller can be used in potentially explosive atmospheres.

SIL-2 Assessment

Safety Integrity Level 2 ensures AP Sensing compliance for operator environments.

UL Certification

The Underwriters Laboratories ensures overall product safety.

Laser Safety

IEC 60825-1:2001

FDA acknowledgement for Laser Sources

Class 1M; FDA 21CFR; 1040.10+; Laser Notice No. 50

Electro-Magnetic Compatibility

IEC 61326:2002

Environmental Testing

IEC 60068-2-6/-64; IEC 60068-2-27

ISO 9001:2000

UL



Contact us for more information!

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AP Sensing China AP Sensing Korea

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