MONITORING STRUCTURES OPERATING UNDER CRYOGENIC TEMPERATURES REQUIRES SPECIAL ATTENTION GIVEN TO THE QUALITY AND LONGEVITY OF ANY OF THE COMPONENTS OF THE MONITORING SYSTEM.

The primary function of monitoring is to enable the timely detection of any condition or behavior that could deteriorate structures and provide an early warning to ensure the safety of the environment.

Optical sensors from SMARTEC have been qualified to operate under cryogenic temperatures. The intrinsic properties of optic sensors allows for compact sensing and cabling, a great variety in the measurable parameters, insensitivity to EMI (Electro-Magnetic Interferences), electrically passive sensors and cable, intrinsically safe.

Sensors operating under cryogenic temperatures operate as contact and non-contact measurements.

These sensors operate reliably in demanding environments, including magnetic field, radiation and vacuum.

References

- Optical Sensors for ITER - France, 2015
- CERN LHC Dipoles - Switzerland, 2000
- LNG Dunkirk - France, 2016
- CryoBragg EU Project, 2011-2013
- Ammonia pipeline, Borealis - France, 2012 - 2017
- Ammonia pipeline, Yara - Italy and France, 2008 - 2016
- Skotan Kedzierzyn hydrogen pipeline - Poland, 2013
- EU Project ADAMOD - Italy, 2008-2011
- PTT LNG - Thailand, 2010 - 2012
- Gulf LNG - USA, 2010
- Canaport LNG - Canada, 2008
- Ethylene pipeline, Sasol - Germany
- Freeport LNG - USA, 2006
- EU-ZEM Project EU, 2001-2004
We are a leading expert in optical sensing, particularly fiber optic sensing to monitor cryogenic structures. We offer a wide variety of sensors using leading-edge technology and we can assist you in identifying the best products for your project and budget.

BENEFITS OF OUR INTEGRATED HEALTH MONITORING SOLUTIONS AND LEAK DETECTION SYSTEMS

Integrated solutions. Providing integrated structural health monitoring solutions for cryogenic structures using advanced optic and fiber-optic technologies

Access data on structure behavior. Logging reliable data.

Condition monitoring. Monitoring the structural impacts of operational and environmental stresses.

Preventive and proactive management. Improving the control of budgets and planning for the unforeseen unavailability of the process.

INSTRUMENTATION AND SAFETY MONITORING IS PERFORMED WITH INSTRUMENTS THAT MEASURE:

- Leaks in vacuum insulated pipes
- Chemical and process production and transfer lines monitoring
- Integrity of cryogenic tanks, hydrostatic test
- Underground gas storage facilities deformations monitoring
- Superconducting magnets strain, movement and thermal behavior
- Superconducting power lines cooling distribution
- Thermal vacuum testing for space infrastructure

TECHNOLOGIES

- Strain surface measurement: Fabry-Perot (FISO), MuST FBG
- Temperature point: Fabry-Perot (FISO), GaAs (FISO)
- Temperature distributed: DiTemp DTS Raman
- Displacement, short range, long range: Fabry-Perot (FISO),
- Non-contact displacement: 3DeMon laser distance meter and SOFO interferometric sensing

Thermal mapping of vessels, pipes and reservoirs

Leakage and displacement in tank annular space

Thermo-mechanical behavior of complex scientific facilities (ITER, France)

Leak detection of cryogenic pipelines

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FABRY-PEROT WELDABLE STRAIN SENSOR
Temperature range 4 to 300K
Strain range 10'000 µƐ
Resolution 0.1% FS (6 µƐ)

FABRY-PEROT TEMPERATURE SENSOR
Resolution 0.01 K @ 70 - 300K
0.1 K @ 20 - 300K
0.5 K @ 10K
1 K @ 4K

MuST FBG WELDABLE STRAIN SENSOR
Temperature range 20 to 300 K
Strain range 10'000 µƐ
Resolution 0.25% FS (23 µƐ)

MuST FBG WELDABLE TEMPERATURE SENSOR
Resolution 0.05 K @ 20 - 300K
0.3 K @ 10 - 20 K
0.5 K @ 10 - 4 K

FABRY-PEROT DISPLACEMENT SENSOR
Temperature range 4 to 300 K
Short range 0 - 10 / 0 - 20 / 0 - 40 mm
Long range 0 - 80 mm (with pulley)
Resolution 0.002 mm

DITEMP DISTRIBUTED TEMPERATURE SENSOR CABLE
Temperature range 80 K to 300 K
Resolution 0.1 K
Distance range of several 100 meters to kilometers (operating temperature dependent)

3DEMON LASER DISTANCE METER
Measurement range 1 to 20 m
Acceptable lateral target movement ± 60 mm
Acceptable target rotation ± 25°
Resolution 0.1 mm

SOFO INTERFEROMETRIC DISPLACEMENT SENSOR
Working distance max. 5 meters
Range ± 20 mm
Resolution 0.002 mm
FIBER OPTIC AND OPTIC CRYOGENIC INSTRUMENTATION & SAFETY MONITORING

Smartec

Smartec is the leading developer, manufacturer and supplier of innovative sensing technologies based on vibrating wire and fiber optic sensors for geotechnical and structural instrumentation.

We are featuring a complete line of conventional sensor-based solutions ranging from the ultra-robust traditional vibrating wire technology to state-of-the-art fiber-optic technology used for the measurement and monitoring of geotechnical projects and structural health monitoring (SHM) of critical assets such as: dams, tunnels, mines, buildings, bridges, nuclear power plants and many other structures too numerous to list.

Smartec offers a wide range of pressuremeters, rock dilatometers, laboratory and in-situ testing equipment for soil and rock.

Services

- System Design
- Installation, Operation and Maintenance
- Data Management
- Data Analysis

Other available Application Notes

- FO Leak Detection for Dams and Dikes
- Dam & Dike Instrumentation and Safety Monitoring
- Tunnel Instrumentation & Structural Health Monitoring
- Bridge Instrumentation & Structural Health Monitoring
- Building Instrumentation & Structural Health Monitoring
- Historical Monument Instrumentation
- Geotechnical and Structural Monitoring
- Nuclear Power Plant Instrumentation
- FO Movement Detection in Tunnels
- FO Leak Detection for Chemical Plants
- FO Leak Detection for Pipelines
- Storage Facility Instrumentation
- Cliff Instrumentation