

Fiji Pipeline Temperature Measurement Optical Cable Model

Article Overview

The Fiji optical cable is designed for distributed temperature sensing (DTS) in pipelines, offering high-resolution, robust fiber optic monitoring for industrial applications.

Overview

The Fiji fiber optic cable is used in distributed temperature sensing (DTS) systems for pipelines, particularly in oil, gas, and LNG applications. These systems allow continuous temperature monitoring along the entire length of a pipeline, enabling leak detection, temperature profiling, and operational safety monitoring. The cable is typically non-intrusive, robust, and suitable for harsh environments, including cryogenic and high-pressure conditions.

Cable Design and Features

- o Core and Sheath: The cable often includes multiple optical fibers (e.g., four-core) with Kevlar yarn reinforcement and a polyethylene sheath, providing mechanical strength and durability during installation.
- o Outer Diameter: Approximately 3.5 mm, balancing flexibility and robustness for pipeline handling.
- o Fiber Type: Single-mode fibers are preferred for DTS applications, compliant with ITU-T G.652/654/655 standards, ensuring low loss and high signal quality over long distances.
- o Temperature and Strain Sensing: The cable supports Brillouin or Raman scattering-based DTS, allowing simultaneous measurement of temperature and strain along the pipeline.

DTS System Performance

- o Spatial Resolution: Typically 2 meters, enabling precise localization of temperature changes or leaks.
- o Temperature Resolution: Around 0.1°C, suitable for detecting small variations in pipeline temperature.
- o Measurement Modes: Single-ended or double-ended configurations improve accuracy and calibration, with double-ended mode providing better temperature resolution.
- o Monitoring Range: Long-range monitoring is possible, with single instruments covering tens of kilometers, extendable with optical amplifiers.

Applications

- o Pipeline Leak Detection: Early warning for LNG or oil pipeline breaches.
- o Operational Monitoring: Real-time temperature profiling during commissioning, cool-down, or normal operation.
- o Structural Health Monitoring: Detecting strain or hot spots in pipelines, flowlines, and coiled tubing.

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o Harsh Environments: Suitable for cryogenic LNG pipelines, high-pressure oil pipelines, and areas with electromagnetic interference .

Installation Considerations

- o Cable Placement: Can be attached, embedded, or buried depending on pipeline design and environmental conditions .
- o Environmental Protection: Armor and sheath selection depend on soil, temperature, and mechanical hazards.
- o Integration: Compatible with DTS units like the HALOTM DTS, which provide multiplexing for multiple fiber channels and rack-mountable instrumentation .

Summary

The Fiji optical cable model is a specialized fiber optic solution for distributed temperature sensing in pipelines, combining high spatial and temperature resolution with mechanical robustness. It is suitable for long-range monitoring, leak detection, and operational safety in oil, gas, and LNG pipelines, and integrates with advanced DTS systems for real-time, continuous monitoring .

Distributed Temperature Sensing (DTS) systems provide temperature information for accurate thermal monitoring, fire detection, and

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The combined length of the sewerage and clean water pipe infrastructure in the UK is estimated to be about 800,000

The ability to measure temperatures and strain at thousands of points along a single fiber is particularly interesting for the monitoring

The leakage detection system based on the distributed fibre optical temperature measurement method is an

Principle of Distributed Fiber Optic Temperature Measurement for Pipeline and Cable The basic principle of distributed fiber optic

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Abstract Fiber-optic distributed temperature sensing (FO DTS) is an emerging technology for characterizing and monitoring a wide

In this study, a method involving the use of distributed fiber optic temperature and strain sensors is presented to

High-definition temperature sensing based on the natural Rayleigh backscatter in optical fiber delivers a

This non-intrusive sensing system proves invaluable in the monitoring of LNG pipelines both for cool down at commissioning, for

Measure the temperature along a fiber optic cable or optical loss/attenuation, bend detection and integrity monitoring (Patent

Example of Strain Measurement Cable (SMC) used for ground movement detection. Examples of qualified armored

Madabhushi et al. used distributed fiber-optic cable temperature sensing to monitor pipeline leakage and proposed

The present paper presents and discusses the possibility to actively and automatically monitor leakages using distributed fiber optics

The optical fiber was installed on the surface of the cable by Li to calculate the conductor temperature through

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