

## Mozambique Pipeline Temperature Measurement Optical Cable Joint



### Overview

We placed the proposed FBG on an energized cable joint of the power distribution grid and measured the temperature.

### Key Takeaways

Distributed fiber optic sensing (DTS) systems enable continuous, real-time temperature monitoring along pipelines using optical cables, providing high-resolution data over tens of kilometers. Overview of DTS Technology

Distributed Temperature Sensing (DTS) systems use standard fiber optic cables as linear temperature sensors to monitor pipelines in real time. The technology relies on Raman or Brillouin optical scattering, where a laser pulse is sent through the fiber and the backscattered light is analyzed to determine temperature along the cable length. The position of each temperature reading is derived from the time delay of the returning light, similar to radar echo analysis, a method known as Optical Time Domain Reflectometry (OTDR). Optical Frequency Domain Reflectometry (OFDR) is a mathematically equivalent alternative, often used for shorter distances or higher resolution applications .

Cable Design and Installation



For pipeline applications, outdoor-rated or armored optical cables are typically used to withstand environmental hazards such as soil pressure, rodents, and mechanical stress. Steel tape armored cables or dual-jacket all-dielectric cables are recommended for direct burial, providing both mechanical protection and high tensile strength while maintaining sensitivity to temperature changes . Proper installation ensures accurate temperature readings without compromising the fiber's ability to detect thermal variations.

### Measurement Capabilities

Modern DTS systems can monitor pipelines over distances exceeding 50 km from a single interrogator, with some systems extending up to 300 km using optical amplifiers. Temperature resolution can reach one meter spatially, allowing precise detection of hot spots, leaks, or abnormal thermal events along the pipeline . Advanced systems, such as enhanced DTS (eDTS), integrate Distributed Acoustic Sensing (DAS) to detect both temperature changes and acoustic anomalies, improving pipeline safety and operational efficiency .

### Applications in Pipeline Monitoring

DTS systems are widely used in oil and gas pipelines, including natural gas and brine pipelines, for:

- Leak detection by identifying localized temperature anomalies
- Operational monitoring to verify flow and prevent overheating
- Structural assessment in areas prone to landslides or mechanical stress
- Long-distance monitoring without the need for multiple sensors or power sources along the pipeline

### Advantages

- Continuous, real-time monitoring along the entire pipeline length
  - High spatial resolution for early detection of leaks or hot spots
  - Resistance to electromagnetic interference and corrosion
  - Integration with advanced analytics, including deep neural networks for rapid data processing and event classification
- In summary, the Mozambique pipeline can leverage distributed fiber optic temperature measurement systems to achieve robust, long-range, and high-resolution monitoring, enhancing safety, operational efficiency, and early detection of potential issues along the pipeline.

## Article Content

Temperature monitoring techniques of power cable joints in

This study proposed a sensor module that can monitor the temperature of the power cable joint using a fiber optic

Mozambique High-Temperature Temperature Measurement Optical

To investigate this aspect, fibre optic cables commonly used for strain (three tight-buffered cables) or temperature (two loose

Temperature monitoring techniques of power cable joints in

We placed the proposed FBG on an energized cable joint of the power distribution grid and measured the temperature. Herein, we

Temperature monitoring techniques of power cable joints

Power cable accidents in UUT internal facilities mostly occur at the joints of power cables. This paper proposes a

Effects of Temperature on MV Cable Joints Tan Delta Measurements

To this purpose, in this paper, using a simple test setup presented in a previous work, the effects of temperature on the cable joint

Strongly robust approach for temperature monitoring of power cable joint

This study aims to monitor the temperature inside power cable joint, with strong robustness to variable thermal

Mozambique Temperature Measurement Optical Cable System

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

OFDR Distributed Temperature and Strain Measurements with Optical

PDF | On Jul 8, 2014, Laurent Maurin and others published OFDR Distributed Temperature and Strain Measurements with Optical

Mozambique Underground Temperature Measurement Optical Cable

Temperature Measurement Using Optical Fiber Methods: Overview The paper deals with the overview of fiber optic methods suitable

Multi-Parameter Optical Monitoring Solution Applied to ...

This work presents a multi-parameter optical fiber monitoring solution applied to an underground power distribution

Mozambique Downhole Temperature Measurement Optical Cable

Downhole fiber optic temperature-pressure innovative measuring system  
Development and measurement of downhole fiber optic

Experimental study on distributed optical-fiber cable for high-pressure ...

The experimental results show that the gas leakage can be detected by an fiber-optic cable located at 100 mm above

Research on Temperature Sensing Method for Three-Core Cable

The preinstalled optical fibers inside the cable dividing conductor were led out to the outside of the terminal and

Application of optical fiber cable for pipeline temperature measurement ...

Optical fiber cables can be effectively used for distributed temperature monitoring along pipelines, enabling real-time detection of

Economic Impacts of Submarine Fiber Optic Cables and

This study explores the economic impact of the international data connectivity delivered by submarine fiber optic cables ("subsea

Accuracy of Distributed Optical Fiber Temperature Sensing for Use in ...

Accurate and rapid detection of leaks is important for subsea oil pipelines to minimize environmental risks and

The design of temperature monitoring system for power cable joint ...

Power Cable Joint is the area where the faults are often happening on the power cable. Real-time monitoring of Power Cable Joint

(PDF) Advancements in Optical Fiber Sensing Systems for Pipeline

Optical fiber sensing technology plays a pivotal role in modern monitoring systems, particularly in the realm of pipeline

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