

Installation of Underground Temperature Measurement Optical Cable in China and Africa

Article Overview

Underground optical fiber temperature measurement systems, such as DTS and OFCPCs, enable real-time monitoring of cable conditions, enhancing reliability, safety, and operational efficiency in both China and Africa.

Overview of Optical Cable Monitoring Technologies

Distributed Temperature Sensing (DTS) uses optical fibers embedded in or attached to power cables to measure temperature along the entire cable length in real time, allowing detection of hotspots, thermal bottlenecks, and abnormal conditions . Distributed Acoustic Sensing (DAS) complements DTS by detecting vibrations and acoustic signals, enabling early identification of third-party interference, excavation damage, or mechanical faults . Optical Fiber Composite Power Cables (OFCPCs) integrate optical fibers directly into the power cable, allowing simultaneous power transmission and communication for smart grid applications .

Benefits of Installation

- o Real-Time Monitoring: Continuous temperature and strain monitoring allows operators to optimize cable loading and prevent overheating .
- o Early Fault Detection: DTS and DAS systems detect anomalies before failures occur, reducing downtime and maintenance costs .
- o Enhanced Asset Management: Systems like OPTHERMO(TM) and AOLCM provide predictive analytics and insulation condition monitoring, supporting long-term infrastructure planning .
- o Adaptation to Smart Grids: Integrated optical monitoring supports dynamic ampacity calculations and self-healing functions in modern distribution networks .

Installation Considerations

- o Cable Type: OFCPCs are preferred for new installations, while existing cables can be retrofitted with DTS fibers.
- o Environmental Factors: In Africa, high ambient temperatures, soil conditions, and seasonal flooding must be considered, whereas in China, urban density and underground congestion influence routing and installation methods .
- o Cost and Scalability: While fiber-optic systems are more expensive than traditional thermistor-based sensors, they provide scalable solutions for long-distance and high-voltage networks .
- o Integration with Grid Systems: Optical monitoring systems should be integrated with SCADA or smart grid platforms for real-time data analysis and automated alerts .

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Regional Implementation

- o China: Extensive urban underground networks and high renewable energy integration make DTS and OFCPCs highly valuable for real-time monitoring and grid optimization .
- o Africa: Emerging power infrastructure benefits from optical monitoring to improve reliability, especially in regions with limited maintenance access and high environmental stress on cables .

Conclusion

The installation of underground temperature measurement optical cables in China and Africa provides critical insights into cable performance, enabling proactive maintenance, improved safety, and optimized energy distribution. Technologies like DTS, DAS, and OFCPCs are central to modern power networks, supporting both operational efficiency and long-term asset management . Proper planning, environmental assessment, and integration with smart grid systems are essential for successful deployment.

Therefore, it is of utmost importance to protect UUTs from disasters. Power cable accidents in UUT internal facilities

The proposed cable temperature measurement system is based on placing NTC thermistors along the cable, with

The 500 kV oil-filled ac submarine cables in the networking project of China's southern coast are large capacity, ultrahigh-voltage

Abstract Distributed fiber optic sensors (DFOSs) possess the capability to measure strain and temperature variations

Abstract Distributed temperature sensing (DTS) using heated cables has been recently developed for distributed

Buried cable installations. Identify cable locations with surface markers. Anticipate obstructions. Test jumpers must be of the same

The 500 kV oil-filled AC submarine cable in Hainan Networking System is the first large capacity, ultra-high voltage cross-sea

Distributed Temperature Sensing (DTS) systems provide temperature information for accurate thermal

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monitoring, fire detection, and

The change in operating conditions of HV underground cable links has led many utilities to consider on-line and/or off

This document provides guidance on best practice for the selection and installation of cables for fiber optic sensing in the power

Underground electrical conductors, both medium-and high-voltage, play a crucial role in energy infrastructure.

China's international interactions, requirements on its networks" ability to provide global services, and both opportunities and

This article experimentally examines the applicability of a temperature measuring and monitoring system using distributed

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

Temperature monitoring using fiber optic sensors to get a distributed temperature profile along an underground cable

The temperature profile obtained from measurements performed with optical fiber DTS method on a 126 m long 154

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