

Installation location of deep-hole fiber optic sensor

Article Overview

Deep-hole fiber optic sensors are typically installed along the wellbore, either inside the casing or in direct contact with the formation, to monitor temperature, strain, and acoustic signals at depth.

Downhole Placement

Deep-hole fiber optic sensors are deployed along the length of the wellbore, often integrated with the casing or tubing to ensure continuous monitoring of the subsurface environment . In geothermal or oil and gas wells, sensors are positioned to capture critical zones such as production intervals, fracture networks, or high-stress regions. For example, in the Utah FORGE EGS project, distributed fiber optic sensing (DFOS) cables were installed in a production well to measure microseismic activity, temperature, and fracture-associated strain at depths where temperatures reached ~235°C .

Installation Methods

- o Casing Deployment: Sensors can be attached to the inside or outside of the casing using clamps or embedded within protective conduits to maintain orientation and prevent damage during cementing or well completion .
- o Direct Formation Contact: In some applications, fibers are embedded in composite tapes or geotextiles and placed in contact with the formation to enhance strain transfer and acoustic coupling .
- o Beacon or Sensor Packages: Small sensor beacons may be installed at specific depths along the wellbore to provide localized measurements, often with pre-programmed activation sequences for temperature or flow monitoring .

Environmental Considerations

Deep-hole sensors must withstand high temperatures, corrosive fluids, and mechanical stresses. Protective measures include nickel alloy sheaths, high-temperature polymer buffers, and polyimide-coated fibers to ensure long-term survivability in harsh downhole conditions . The orientation of the fiber is critical for accurate measurements, and technologies like FIBERSIGHT(R) map sensors are used to determine cable orientation immediately after casing deployment, eliminating the need for additional mapping runs .

Summary

In practice, the installation location of deep-hole fiber optic sensors is carefully selected to maximize data quality and sensor longevity. Sensors are typically deployed along the wellbore, either attached to casing, embedded in protective conduits, or in direct contact with the formation, with special attention to orientation,

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mechanical coupling, and environmental protection to ensure reliable monitoring of temperature, strain, and acoustic signals at depth .

Optical fiber sensors have made a significant improvement in the oil and gas industry since the first down-hole

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

FIBERSIGHT map sensors are deployed along the wellbore during the casing run to determine and communicate the orientation of a

However, optical fiber sensors enable monitoring of the entire cementing process. Here, we investigate the cement

A major factor in the coupling of acoustic or vibrational signal transmitted to the sensing fiber is the location and installation method of

Device must be deployable downhole without compromising completion. Such as enclosed within the envelope of typical cable

serviceability. The DFOS sensors can be either installed onto tunnel surface using a continuous bonding method or a fixed-point

This sensor installation kit is intended for the bonding down of 10 m of Luna's fiber optic sensor onto a relatively smooth metallic or

The Installation After the process of designing fiber optic networks is completed, the next step is to install it. What do we mean by the

A successful underground fiber optic cable installation begins with careful planning and

Recent advances in various FOS based monitoring systems, including Brillouin time domain distributed optical sensors

2.3. Direct-buried installations are often combined with duct installations to go under obstacles like roads, driveways, etc. At the

In this paper, the working principle of different fiber optic sensing technologies, the development of fiber

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optic-based

All three of the distributed fiber optic sensing technologies can be used in monitoring pipelines, as each provides unique insight into

This article provides an overview of fiber optic sensor installation

The distributed fiber-optic sensors have proven their ability to provide significantly valuable

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