Fiber Optic Sensor Placement for Well Logging

Article Overview

Optimal fiber optic sensor placement in well logging involves deploying distributed sensing cables along the wellbore to achieve full coverage for temperature, acoustic, and pressure monitoring.

Key Principles of Placement

Distributed Fiber Optic Sensing (DFOS) technologies, such as Distributed Temperature Sensing (DTS) and Distributed Acoustic Sensing (DAS), use the fiber itself as the sensing element, enabling continuous monitoring along the entire wellbore rather than at discrete points . This allows for real-time detection of leaks, cement integrity issues, and mechanical anomalies, providing a comprehensive view of well conditions . Reflective fiber-optic sensor networks can be deployed along the outer surface of the tubing inside the well, with each fiber end coated with a reflective film to enable precise fault localization . This approach supports long-term monitoring of temperature, pressure, and acoustic signals, and is particularly effective when combined with DTS and Fiber Bragg Grating (FBG) sensors .

Deployment Strategies

o Permanent Installation: Fiber optic cables are cemented or strapped along the wellbore for continuous, long-term monitoring. This is ideal for wells requiring ongoing integrity assessment and production optimization .

o Intervention-Based Deployment: Cables can be temporarily deployed using dynamic de-spool probes, which allow rapid, end-to-end surveys without wireline or slickline operations. This method is efficient for high-volume or reactive diagnostics .

o Cable Positioning: Placement should ensure close contact with the tubing or casing to maximize strain and acoustic signal transfer. For strain monitoring, cables may be embedded or attached to the structure, while for temperature and acoustic sensing, proximity to fluid flow paths is critical .

Practical Considerations

o Cable Type: Select cables designed for the specific sensing application (DTS, DAS, DSS) and environmental conditions, including temperature, pressure, and chemical exposure .

o Installation Method: Options include direct attachment, embedding in cement, or deployment in conduit. The method affects signal fidelity and long-term durability .

o Redundancy: Incorporating redundant fibers or reflective networks enhances reliability and allows fault detection even if a fiber is damaged .

o Data Integration: Combining DTS and DAS measurements provides insights into flow dynamics, leak detection, and mechanical integrity, enabling proactive well management .

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Summary

Effective fiber optic sensor placement for well logging requires continuous coverage along the wellbore, careful selection of cable type and installation method, and consideration of permanent versus intervention-based deployment. By integrating DTS, DAS, and reflective sensor networks, operators can achieve high-resolution, real-time monitoring of well integrity, fluid dynamics, and mechanical conditions, significantly improving diagnostic accuracy and operational efficiency .

This paper presents several recent deployments of in-well fiber optic monitoring systems, including descriptions of the

Optimize well placement and completion design using Silixa"s fiber-optic surveillance for fractured reservoirs.

Distributed fiber optic sensing technology is an important part of the fiber optic sensing field, which can continuously

Section 3 describes different types of distributed fibre-optic sensors used in oil and gas applications and Section 4

Through the actual test results of the heavy oil area, the feasibility and advantages of the distributed optical fiber

Expro"s Distributed Fiber Optic Sensing (DFOS) intervention enables the continuous and distributed

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This paper proposes a reflective fiber-optic sensor network for multiparameter state monitoring in oil and gas wells. The

Optiq solutions can be seamlessly integrated with any existing fiber-optic infrastructure (such as in pipeline integrity monitoring) or by

The methodology comprises a comprehensive analysis of completion and stimulation reports, fiber optics,

1 Introduction Fiber-optic sensing technology has long been used in single-well hydraulic fracturing analysis, and its focus has been

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In the oil and gas industry, distributed fiber-optic sensors can provide significantly valuable information throughout the

Fiber-optic-system installations have reduced the need for intervention by logging tools and

These results demonstrate that fiber optics represents a paradigm shift in well integrity assessment, transitioning from

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

Hier sollte eine Beschreibung angezeigt werden, diese Seite lässt dies jedoch nicht zu.

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