

How to measure fiber optic cable wells



AI Overview

Fiber optic cables in wells are measured and monitored using distributed sensing technologies such as DTS, DAS, and DSS, deployed either as permanent or disposable cables to capture strain, temperature, and acoustic data.

Types of Fiber Optic Cable Installations

Permanent Fiber-Optic Cables: These are robust, long-term installations designed to withstand harsh downhole conditions, including high pressure, temperature, and corrosive fluids. They typically use a fiber-in-metal-tube (FIMT) design, where optical fibers are hermetically sealed in stainless steel or INCONEL tubes, with protective gels and polymer layers to prevent microbending and chemical ingress. These cables support distributed temperature sensing (DTS), distributed acoustic sensing (DAS), and distributed strain sensing (DSS) for continuous monitoring throughout the well's life.

Disposable Fiber-Optic Cables: Single-use fibers, such as Halliburton's ExpressFiber, can be pumped downhole in offset wells for temporary monitoring. These cables are bare fiber without outer protective layers, making them sensitive but cost-effective. They allow for cross-well monitoring of fracture growth, microseismic activity, and strain during hydraulic fracturing operations, and can be replaced easily if damaged without halting operations.

Measurement Techniques

Distributed Temperature Sensing (DTS): Measures temperature along the length of the fiber to detect fluid movement, leaks, or thermal anomalies.

Distributed Acoustic Sensing (DAS): Converts the fiber into a series of microphones to detect vibrations, microseismic events, or frac hits.

Distributed Strain Sensing (DSS): Measures mechanical strain along the wellbore, useful for detecting casing deformation or stress changes.

Tools and Procedures

Optical Time-Domain Reflectometer (OTDR): Used to measure fiber length, loss, and integrity by sending pulses of light and analyzing reflections.

Power Meters and Light Sources: Measure insertion loss and optical power to ensure the fiber is functioning correctly.

Interroga...

Article Content

Cable Installation Considerations for Structure Monitoring

Optimum performance for sensing objectives depends on cable type, installation method, cable position and the site environmental conditions. This applies to existing cables as well as those installed

Distributed fiber optic temperature and strain sensing in cementing

Abstract In this study, we installed two fiber optic cables with different designs into a new well, a soft-flat cable and a stainless-steel cable, for distributed fiber optic sensing in cementing and

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Permanent fiber-optic cable

Optiq real-time fiber-optic interpretation and analysis uses proprietary SLB algorithms and dynamic well models to analyze raw DTS, DAS, and DSS data in real time. Subsequently, a cloud or web interface

Cable Installation Considerations for Structure Monitoring

The most prevalent sensing technology for structure monitoring applications is DSS, which monitors strain related to mechanical loads of structures. Cables for DSS must be designed and installed in a

Fiber Optic Distributed Temperature Sensing | US EPA

Abstract: Raman spectra distributed temperature sensing (DTS) by fiber-optic cables has recently shown considerable promise for the measuring and monitoring of surface and near-surface

Fiber Optic Sensing for Downhole Monitoring in Oil & Gas

The subsurface environment of oil and gas wells presents extreme challenges—elevated temperatures, high pressures, corrosive fluids, and

How to Measure the Length of my Fiber Optic Cable

Optical measurement also saves time by eliminating the need to estimate the length of the fiber run with a measuring wheel.

Well and reservoir surveillance | FOWell | FEBUS Optics

Our FOWell solution is a Measurement, Monitoring, and Verification (MMV) technology based on distributed fiber optic sensing, that ensures real-time and continuous monitoring of reservoir integrity

Distributed fiber optic temperature and strain sensing in cementing

In this study, we suggest utilizing distributed fiber optic sensing techniques for multipurpose acquisition (injection profile, well and caprock integrity and early leakage detection) in

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RS PRO 8967015 Digital Counter Electromechanical

RS PRO Fibre Optic Sensor, IP65This RS PRO fibre-optic sensor or amplifier can be used in a variety of sensing applications. Once connected to a fibre-optic

Geomechanical Monitoring of Caprock and Wellbore Integrity Using

We applied the DFOS technique to our field experiments when injecting and extracting fluid from a shallow well. The shallow well was drilled to a depth of 300m and three optical fiber cables

OTDR – Optical Time Domain Reflectometer

Ensure the integrity of your fiber optic network with an Optical Time Domain Reflectometer (OTDR). OTDR testing analyzes fiber optic cable performance

The FOA Reference For Fiber Optics

See the Test section of the FOA Online Guide for much more detail. After fiber optic cables are installed, spliced and terminated, they must be tested. For every fiber
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Theory and Practice of a Flexible Fiber-Optic Cable in a ...

Summary. A flexible optical fiber cable, either as a wireline or a disposable fiber deployed using a pumped fiber payout shuttle, in a horizontal well, can be used to measure distributed near

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This document contains a long list of words beginning with "ab-" or "ac-". It does not appear to be a coherent text, but rather a collection of unrelated terms.

ZYGO | Precision Optical Metrology | Optical Components

ZYGO is a worldwide supplier of optical metrology systems, custom optical components, and complex electro-optical systems design and manufacturing.

The FOA Reference For Fiber Optics

Let's examine a common fiber optic measurement, insertion loss of a fiber optic cable plant. To make this measurement, we need a light source – let's make it

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Case Study

Each of these bands has been shown to be sensitive to specific physical changes in the measured media, such as changes in temperature, strain, and pressure. These are the basic methods by which

The Professional's Guide to Fiber Optic Testing: Methods ...

Troubleshooting fiber optic issues? This guide covers testing techniques, interpretation of results, and the right tools for every scenario.

Fiber Optics | GEO PSI

By pairing fiber optics with gauge sensing technology, we give you a more complete picture of downhole conditions than either technology can

Real-time fiber-optic interpretation and analysis

Interpret and analyze fiber-optic data as it's captured, using edge automation that eliminates delays and manual interpretation workflows. Understand flow behavior, injection performance, and well integrity

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