

Article Overview

Pipeline and downhole wells typically use tubing-encapsulated fiber optic cables (TEC) or permanent downhole fiber-optic cables with metal tube protection to withstand extreme conditions.

Cable Types and Construction

Permanent downhole fiber-optic cables are designed for long-term monitoring in wells and pipelines. They often use a tube-in-tube design, where optical fibers are housed in a hermetically sealed stainless steel or INCONEL tube (Fiber in Metal Tube, FIMT). This core can contain a mix of single-mode and multimode fibers for distributed temperature, acoustic, and strain sensing (DTS, DAS, DSS). Filling gels inside the tube protect against microbending and chemical ingress, while an outer polymer layer provides mechanical buffering and centralization. The outermost tube acts as a primary pressure barrier, shielding the fibers from high pressure, temperature, mechanical shock, and corrosive fluids. Tubing Encapsulated Cables (TEC) are another common type used in oil and gas wells. TEC cables consist of a fiber optic line protected by a metal tube, often with an additional polymer jacket for extra durability. They are engineered to maintain signal integrity under high pressures, elevated temperatures, and corrosive fluids, enabling real-time communication with downhole sensors, valves, and artificial lift systems.

Applications

Fiber optic cables in pipeline wells are primarily used for:

- o Distributed Temperature Sensing (DTS) to monitor temperature variations along the well or pipeline.
- o Distributed Acoustic Sensing (DAS) for detecting vibrations, flow, or acoustic signals.
- o Distributed Strain Sensing (DSS) to measure mechanical stress or deformation in the well structure.
- o Hybrid applications, combining fiber optics with electrical or hydraulic lines for integrated monitoring and control.

Material and Durability Considerations

- o Metal tubes: Stainless steel, nickel-based alloys, or duplex stainless steel provide corrosion resistance and mechanical strength.
- o Polymer jackets: Extruded coatings protect the cable during handling and installation.
- o Filler gels: Prevent microbending and chemical damage to the fibers.
- o Design variants: Tube diameters range from 1/8" to 5/8" with varying wall thicknesses to suit different well conditions. These cables are engineered to survive harsh downhole environments, including high pressure, high temperature, corrosive fluids, and mechanical stress, ensuring reliable long-term monitoring and data transmission in pipeline and well applications.

Fiber Optic Cable for Pipeline Wells

For pipeline monitoring applications, distributed fiber optic sensing cables should protect the optical fibers inside while still allowing

Applications such as pipelines, LNG facilities, waterways, industrial facilities, power cables, dams, power generation facilities like

Fibercore offers a range of designs for downhole fiber optic cable to meet the specific requirements of your

In the dynamic field of Oil & Gas, our specialized Fiber in Metal Tubes (FIMTs) are instrumental in advancing fiber optic solutions for

Optimum performance for sensing objectives depends on cable type, installation method, cable position and the site environmental

Fig. 1--For distributed-temperature applications, optical fibers were traditionally deployed

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

The most prevalent sensing technology for structure monitoring applications is DSS, which monitors strain related to mechanical

Distributed sensing cable in industrial environments Sensing can take one of several technological forms, and can be used in many

We offer customized and fully functional fiber optic devices in oil and gas as well as petrochemical

Fiber optic cable selection for oil and gas: refinery, pipeline, and wellsite installation including armored, ADSS, and

The use of fiber optic sensors for oil and gas applications has been driven in part by the inherent advantages that the technology

Since then we have continued to innovate and today we have a product line that offers solutions for the full

This article covers cable type selection for refineries, pipeline ROW, and wellsite installations, including



Fiber Optic Cable for Pipeline Wells

ATEX/NEC

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