Schlumberger

WellWatcher BriteBlue HT

High-temperature multimode DTS fiber

APPLICATIONS

- Measures distributed temperature in production and injection wells
- Monitors reservoir flow contributions and decline
- Monitors production rate to allow easy control of drawdown
- Optimizes gas lift and monitors tubing integrity

BENEFITS

- Enhanced production management and recovery through improved reservoir surveillance
- Reduced downtime and greater productivity because of permanent real-time in-well monitoring and faster, more precise identification of production problems
- Cost savings as a result of greater operating efficiency, less downtime, and increased production

FEATURES

- Monitoring of events as they occur
- Fit-for-purpose fiber-optic monitoring solution
- Negligible loss characteristics in a hydrogen environment
- High-temperature and chemical resistance capabilities for extreme applications
- Rugged construction and greater operational reliability
- Highly accurate, reliable results in harsh environments resulting from design innovations

The WellWatcher BriteBlue HT* high-temperature multimode DTS fiber is a permanent in-well reservoir monitoring system that improves recovery through enhanced reservoir surveillance. The fiber can be used for sensing only or for high-speed communication between a downhole sensor and a surface unit.

The fiber design complements distributed temperature sensing (DTS) fiber-optic technology, which allows downhole distributed temperature profiles to be monitored at the surface in real time.

At the surface, the data can be transmitted to multiple remote locations via satellite, Internet, and cable communications, allowing operators to immediately identify the time, location, and reasons for changes in temperature.

High-temperature hydrogen effects

Optical fibers can vary in performance when exposed to harsh oilfield wellbore environments. Most start to degrade when exposed to high levels of hydrogen, such as in steam-assisted gravity drainage (SAGD) wells. The degradation is accelerated at high temperatures and eventually prevents the laser pulse from transmitting energy down the fiber. Power losses, incorrect measurements, and even system failure can result.

Improved and rigorously tested technology

The WellWatcher BriteBlue HT fiber, however, was designed especially for use in extreme heat and hydrogen environments. During rigorous testing, the fiber was proven to survive significantly longer than any other fiber at high temperatures and high levels of hydrogen. This testing has allowed advanced modeling programs to be developed that can predict a fiber's performance when it is exposed to high temperatures and hydrogen over time.

The fiber that resulted showed a dramatic increase in light transmission, particularly for wavelengths related to distributed temperature monitoring, exceptional resistance to hydrogen, and enhanced performance in harsh environments. The cumulative effect of these fiber innovations is less downtime, more efficient operations, greater cost savings, and increased production.

The WellWatcher BriteBlue HT high-temperature multimode DTS fiber, installed in a heavy-oil thermal recovery application, is pumped in and through a conduit located inside a coiled tubing string using Schlumberger patented techniques. The coiled tubing is hung from the surface across the producing interval, and the temperature of the entire well is monitored to ensure that the correct level of subcooling is maintained to avoid steam breakthrough from the injector above.

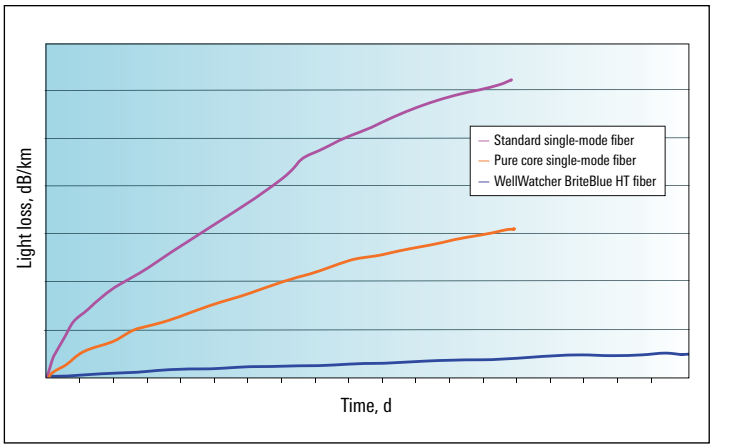
WellWatcher BriteBlue HT

The WellWatcher BriteBlue HT fiber shows lower loss rates than single-mode fibers, resulting in a much longer system life and significantly better spatial resolution. Moreover, time to reach a particular temperature resolution is faster because of the greater volume of backscatter light captured than with single-mode fibers.

Field trials in SAGD wells

As part of the qualification process, WellWatcher BriteBlue HT fiber has been installed in SAGD wells in temperatures as high as 300 degC [572 degF]. The first well installed began operating in April 2007 and continues to show excellent resistance to hydrogen degradation.

These SAGD installations have shown loss rates of <0.25 dB/km/year at elevated temperatures, compared with previous best available fibers, which showed loss rates of >12 dB/km/year under comparable conditions. Performance increased >50 times, which complements the laboratory qualification.



The WellWatcher BriteBlue HT high-temperature multimode DTS fiber transmits more light than conventional single-mode fibers when interrogated by a distributed-temperature acquisition unit in harsh, accelerated test conditions: 250 degC [482 degF], 3,447 kPa [500 psi], and high levels of hydrogen.

WellWatcher BriteBlue HT Fiber Specifications

Fiber type	Multimode
Maximum operating temperature, degC [degF]	300 [572]
Fiber coating material	Carbon polyimide
Overall fiber diameter, um	155 ±1
Fiber core diameter, um	50 ±1

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