

WellWatcher Neon

DTS, DAS, and PT gauge system

APPLICATIONS

- Allocation of reservoir production or injection using inflow and outflow temperature profiles
- Borehole seismic surveys through optical vertical seismic profile (VSP)
- Optimization and diagnostics of gas lift systems
- Monitoring of tubing and completion equipment for leak integrity and flow assurance
- Monitoring of mudline-to-riser temperature profiles for riser integrity
- Dual-redundancy solutions through simultaneous optical and electrical measurements

BENEFITS

- Reduces costs and complexity through the use of a single cable to run electrical and fiber-optic sensors
- Enables better understanding of the well and enhances production and reservoir characterization through the combination of pressure, distributed temperature, and distributed acoustic measurements
- Improves production management with real-time measurements for immediate indication of changing downhole conditions
- Provides long-term reliability with field-proven WellWatcher* permanent monitoring systems and Intellitite* downhole dual-seal dry-mate connectors

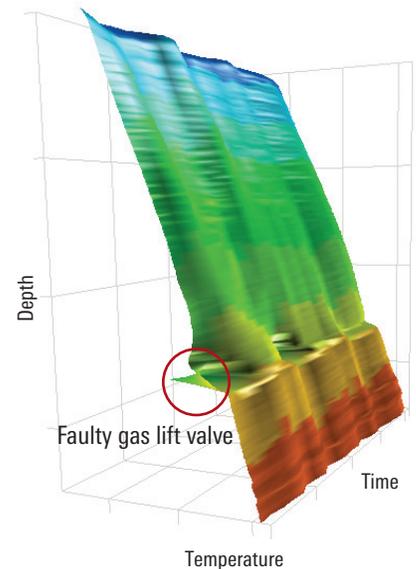
FEATURES

- Survey and diagnostic services adaptable to the project needs
- Multiple fibers per cable: one for DTS, a second for DAS, and a third for deployment of an optical pressure gauge
- Fiber-optic line able to operate independently of electrical downhole gauges
- Hybrid optoelectric equipment with minimal impact on completion, wellhead interface, and installation procedures
- Permanent downhole cable qualified for corrosive environments through rigorous testing

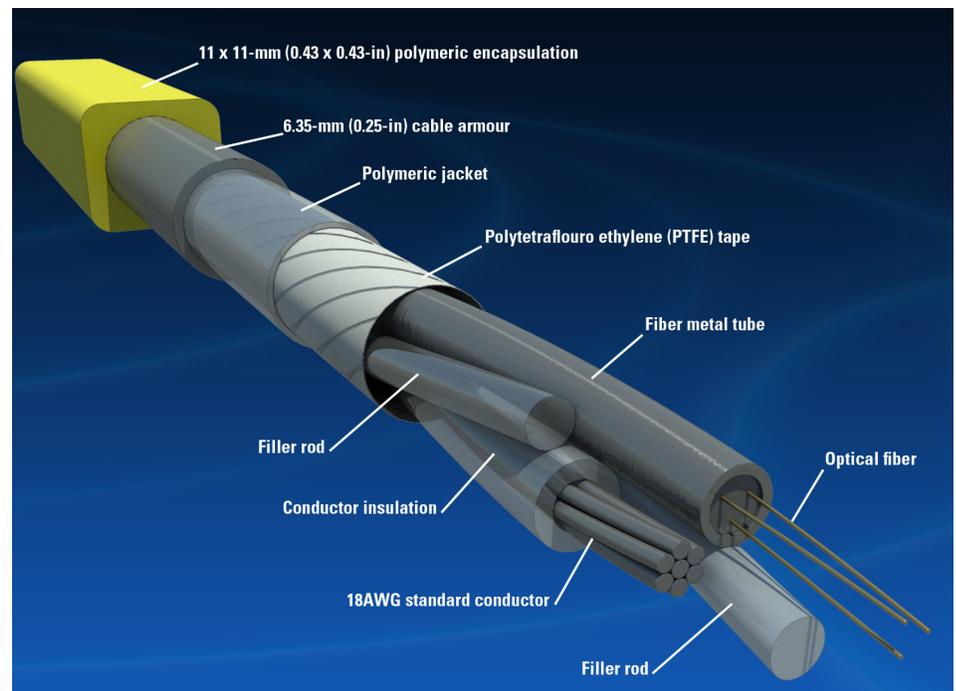
The WellWatcher Neon* DTS, DAS, and PT gauge system comprises an optoelectric permanent downhole cable, a splice connector, and the option to multidrop gauges on a single cable. The hybrid cable expands the capability of traditional WellWatcher permanent monitoring systems by adding fiber-optic distributed temperature and acoustic sensing to the same 1/4-in control line. The combination helps improve well productivity by identifying trends throughout the producing life of a well or field.

The DTS data is typically used for allocation of injection or production and for optimization and diagnostics of the upper completion. The DAS data is used for VSP as well as leak detection and flow properties analysis.

A special wellhead outlet for splitting the electric and fiber-optic lines is also available. The reliability of the downhole connectivity equipment is ensured by the field-proven Intellitite downhole dual-seal dry-mate connector.



In a gas injection well with a slugging injection valve, distributed temperature measurements can quickly identify the problem valve, saving time during valve replacement and minimizing lost production.



The WellWatcher Neon system cable enables fiber-optic sensors and electrical downhole permanent gauges to be run simultaneously.

WellWatcher Neon

Electric conductor and fiber-optic line

The WellWatcher Quartz* premium high-temperature, high-resolution PT gauges and WellWatcher Quartz LT* high-resolution PT gauges, as well as WellWatcher Sapphire* PT gauges, can operate on the electrical conductor of the WellWatcher Neon system. The fiber-optic line operates independently of the electric conductor and does not affect its reliability. This optoelectric cable is externally identical to the permanent gauge downhole cable and no modification to the gauge monitoring system is required.

Distributed temperature data logging

The information obtained from the fiber-optic distributed temperature sensors combined with that from the electrical pressure and temperature gauges provides a more thorough understanding of the reservoir than either sensor would provide separately. For example, the data can enable accurate diagnostics to be carried out on gas lift systems, with the added capability of quickly identifying a faulty valve or unstable flow. In addition, the temperature profile along the tubing can be used to identify conditions such as sealing integrity loss. In many cases, the optoelectric cable can be

extended across the reservoir to establish inflow and outflow contributions from the temperature profile and pressure data.

The cable provides temperature measurements every 0.5 m [about 1.6 ft] along its entire length, producing a profile of temperature effects along the production string and—when applicable—across the mudline. The fiber-optic line can be interrogated on a continuous or intermittent basis to provide rapid wellsite diagnostics without interfering with production. At the surface, data can be transmitted to multiple remote locations via cable or wireless technologies.

Multiple optical measurements

In addition to DTS and DAS, the WellWatcher Neon system can be used for other optical measurements. For example, a fiber-optic pressure gauge can be connected to the optoelectric cable in addition to electrical gauges. This setup provides redundancy not just in hardware but also in measurement principles. Other measurements possible with the WellWatcher Neon system include optical distributed strain sensing.

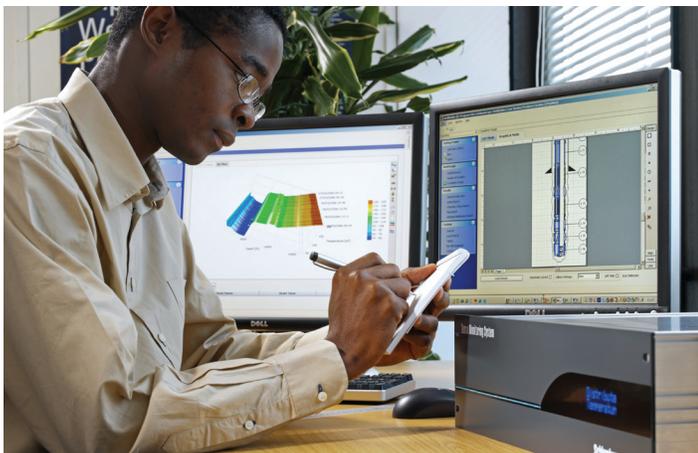
Improved production and reservoir management

THERMA thermal modeling and analysis DTS software defines flow by analyzing DTS data in the wellbore and in the near-wellbore area. The software calculates flowing well temperature on the basis of reservoir, fluid, well, and completion properties. Variables that control flow in the reservoir—such as permeability—are adjusted until the measured and calculated data coincide. At that point, distribution of the variables in the reservoir zones is uniquely defined, and the resulting model is used to determine flow rate from individual zones. THERMA software features a dedicated module for DTS modeling in gas lift applications.

With the help of the software, DTS data can provide critical information on

- mudline-to-riser transfer
- artificial lift system operation
- flow control valve performance
- tubing or casing integrity
- flow assurance
- inflow temperature profiles

and other applications to support production and reservoir performance management.



THERMA* thermal modeling and analysis DTS software calculates flowing well temperature on the basis of reservoir, fluid, well, and completion properties.

WellWatcher NEON System Specifications

Operating temperature range, degF [degC]	–4 to 365 [–20 to 185]
Working pressure, psi [kPa]	20,000 [137,895]
Storage temperature, degF [degC]	–40 to 140 [–40 to 60]
Optical design life, years	>5
Number of fibers	Up to three
Type of fibers	Multimode and single mode
Number and type of conductors	One, 18 AWG (standard)
Electrical rating	700 V DC, 3 A max.
Max. installation length, ft [m]	32,800 [10,000]
Cable armor material	INCONEL® 825
Cable encapsulation options	Polyolefin, Rilsan®, ETFE [†] , PFA [‡] , FEP [§]

*Ethylene tetrafluoroethylene

†Perfluoroalkoxy alkanes

§Fluorinated ethylene propylene

*Mark of Schlumberger

Other company, product, and service names are the properties of their respective owners.

Copyright © 2016 Schlumberger. All rights reserved. 15-CO-13321

slb.com/WellWatcher

Schlumberger