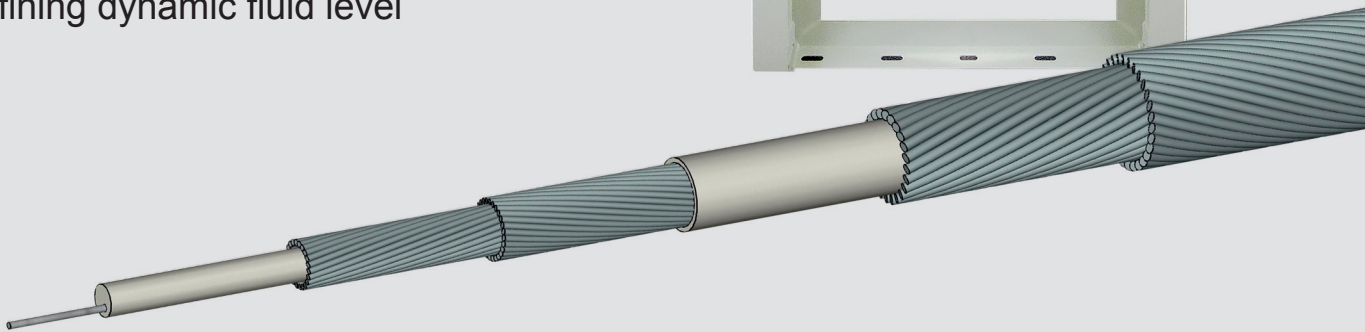


KVANT+

Fiber optic downhole monitoring system

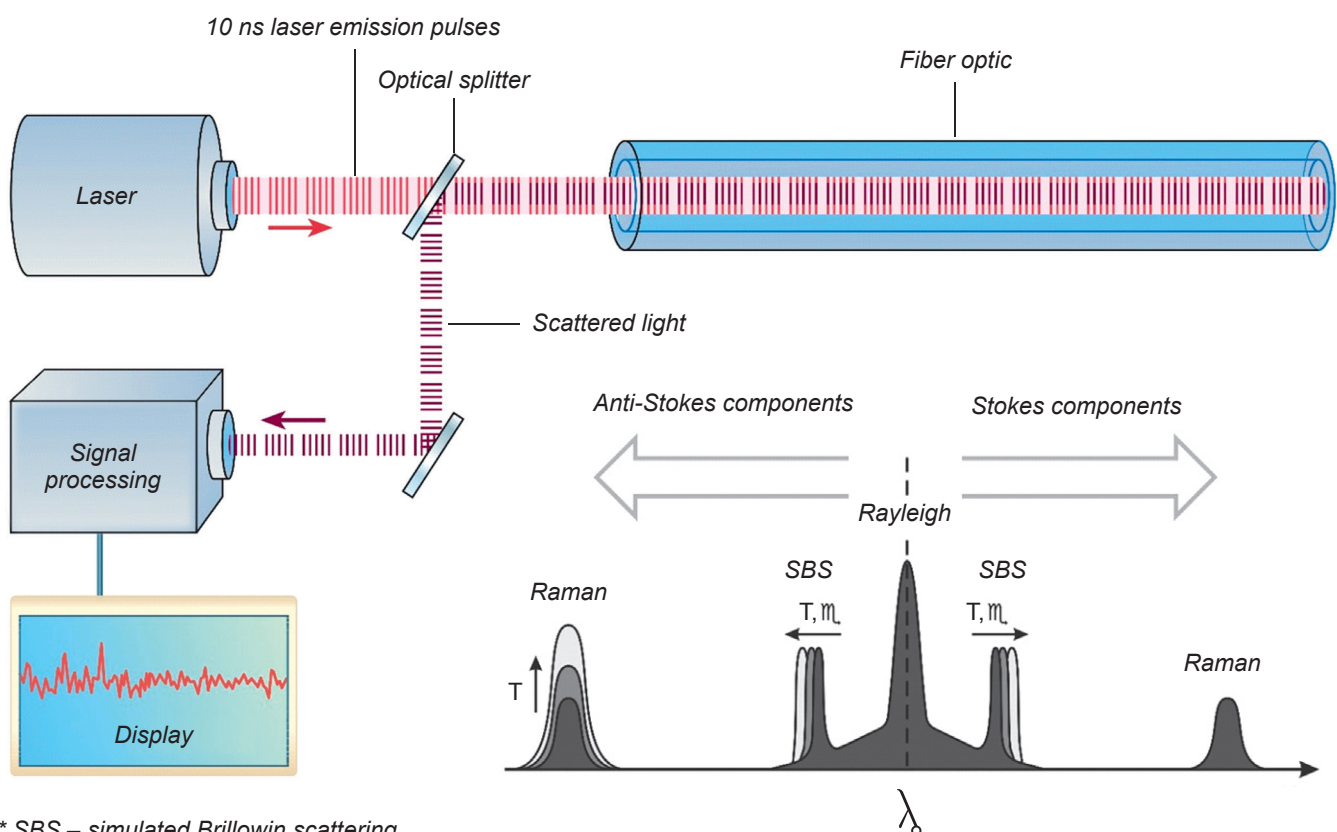
- Measuring and recording temperature distribution along fiber optic cable run in a wellbore
- Monitoring ESP temperature to prevent overheating
- Locating wellbore leakage
- Defining dynamic fluid level



Principle of operation

Operation principle of the IRZ TMS-Kvant+ system is based on the Raman Effect, i.e. on combinational scattering arising from inelastic scattering of input light photons in the medium where atoms of molecules are thermally oscillating at low frequency.

Optical recorder located in the controller generates laser emission which propagates along the fiber optic cable and scatters in it. As a result, the scattering spectrum gains additional frequencies with magnitude depending on the scattering medium temperature.



* SBS – simulated Brillouin scattering

Armored fiber optic sensor cable

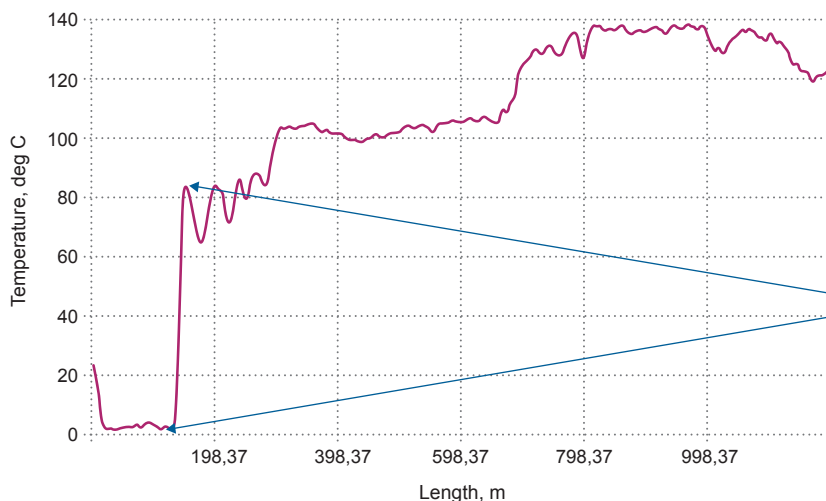


Encapsulated armored fiber optic is a sensing element of the system, directly detecting ambient temperature influence. Cable shell protects the fiber against mechanical stress and aggressive medium.

Advantages

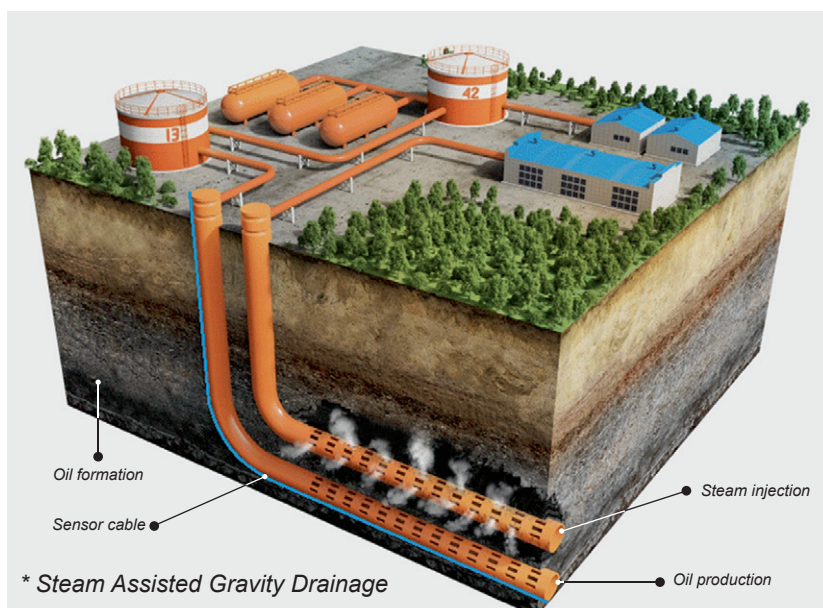
- Temperature is measured simultaneously along the entire cable length, with forming the temperature log, i.e. continuous temperature profile of the analyzed medium with time reference
- Fiber optic sensor cable is not prone to EM influence, ensures full explosion and fire safety
- The surface controller is capable of transmitting temperature logs using both Ethernet TCP/IP and RS485 Modbus RTU interfaces as well as GPRS modem
- Smart operation mode of the surface controller allows for analyzing temperature logs and giving commands onto control devices if/when temperature exceeds the allowed limits which significantly increases equipment life and decreases emergency risks at the same time
- The system is certified as a temperature measuring instrument

Operation examples



Temperature log

Indicating temperature “abnormalities”, i.e. spots with changed temperature



SAGD* – production technology for heavy crude oil and bitumen

One of Enhanced Oil Recovery methods



Specification

Parameter	Value	
	Default version (outdoor)	Hi-accuracy version (indoor)
Temperature measurement range	-55... +300 °C	
Temperature measurement accuracy*	±2.0	±0.5 °C
Temperature resolution	0.01 °C	
Spatial resolution	0.81	0.25 m
Fiber optic type	Single mode	
Measuring optic channel length	Up to 6 km	
Number of optic channels	1; 4	
Single measurement time	1; 3; 5; 10; 15 minutes	
Switchboard supply voltage	220 ± 40 V (50 ± 1 Hz)	
Switchboard auxiliary circuits voltage	24 V	
Switchboard battery life while operating at ambient temperature from minus 30 to +50°C	4 hours minimum	
Enclosure class	IP54	
Switchboard operating temperatures*	-60... +50 °C	+5... +50 °C
Data communication interfaces	USB-port; Ethernet-port (RJ-45); RS-485; GPRS modem, Wi-Fi, WiMax	
Dimensions	674 x 365 x 1850 mm	
Number of fibers in cable sensor	1 to 4	
Cable sensor operating temperatures	-55... +300 °C	
Cable sensor OD	7.4 mm or other at request	
Tensile strength	30 kN	

* Optional. Depending on version

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