Sensyguard - FO

Skin Temperature Monitoring System
Fibre Optic Temperature Measurement System

- Passive sensor, consequently no influence of the temperature field.
- Local temperature increases can be detected with a high degree of positional accuracy.
- The temperature curve along the link or on the surface can be determined with high accuracy in a short measuring time.
- Small size, flexible installation.
- No potential spreading, ground loops, etc.
- No electromagnetic influence on the measurement signal and the environment.
- Connection technique with conventional tools.
- Low maintenance cost: system self-test.
- Possibility of long-time monitoring.
- Ex-approved.

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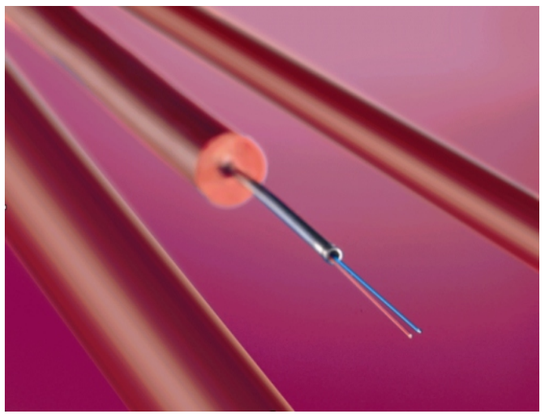
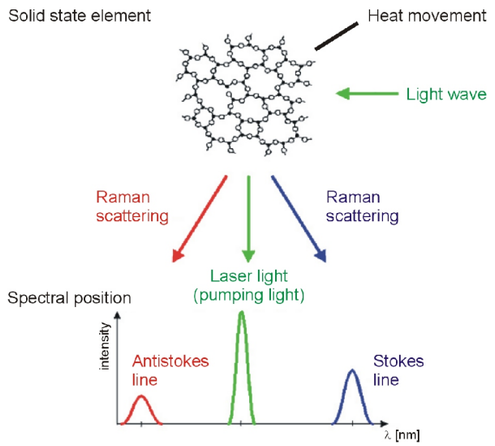
SENSYGUARD - FO
Fibre Optic Temperature Measuring System

Due to their excellent transmission characteristics fibre-optic conductors have become well established in communications engineering. The decisive advantages of fibre-optic conductors over copper lines are the electromagnetic compatibility and the enormous transmission capacities. Fibre-optic conductors are suited not only to information transmission but also as **linear sensors** for detecting physical variables such as temperature, humidity, compressive and tensile forces, current or voltages. Over the past years international research and development activities in the field of locally distributed sensors and measuring systems based on fibre-optic conductors has increased significantly. The reasons for this are the growing demand of the industry for locally distributed sensor networks for controlling and visualizing large installations and processes, as well as for spatially distributed sensor systems there are practically no technical alternatives to fibre-optic measuring systems.



The fibre-optic temperature measuring system works with laser light that is coupled into the optical fibre. In liquids the density and consequently the refractive index varies from place to place due to the lack of thermal homogeneity.

As quartz (from which optical fibres are made) represents an undercooled liquid, inhomogeneities remain after the melt has solidified. At these microscopically small density fluctuations part of the transmitted light is scattered, that is, it is deflected from the original propagation direction.



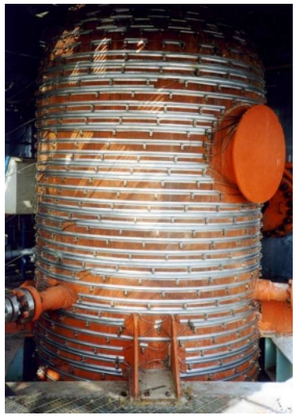
Light transmitter through an optical fibre cable is attenuated by scatter in all fibre positions. In addition to this phenomenon (Rayleigh scatter) there is another continuous type of scatter in each fibre position. This so-called Raman scatter is dependent on the local fibre temperature. The scattered light occurring in a position is transmitted in all directions, also backward. This backscattered light is transported by the optical fibre back to the coupling point and received by the evaluation unit. The position of the backscatter can be determined based on the known propagation speed of light in the fibre.
As the level of the Raman back scatter signal is linked directly to the temperature at the corresponding fibre position, the temperature along the fibre can be determined after suitable mathematical processing and correction of the back scatter signals.

Fields of application

The fibre-optic temperature measurement technique opens new possibilities in detecting, monitoring and analysing thermal processes in industrial installation, in traffic engineering, in geology and the environment.

Application in industrial installations for monitoring process systems

The measuring system developed is ideally suited to being a hot-spot detector for monitoring components, such as gasifiers and gas coolers, which have protective, heat-insulation walls.



It is also particularly appropriate when installed as a leak detector on insulated plant components such as pipes, pipe fittings and containers, etc. By capturing the influencing variable "Temperature" as a continuous profile, significant advantages over conventional techniques employing discrete sensors are achieved.
Also complex surface structures can be evaluated through direct installation of the sensor material. The recorded measurement data can be processed and visualized in real time. The graphic representation takes into consideration the specific routing of the sensor cable. SENSYGUARD - FO is Ex-approved and suitable also in extreme hazardous area i.e. in tanks and tankers.

Application in electrical power cables

The operation of power cables is affected by the temperatures in the cables and the thermal conditions along the cable route. Optical fibres integrated as sensors in power cables allow optimization of the cable links and the localization of andropogeneously influenced hot spots along the cable route.

Application in pipelines

Utilization in **long-distance heat** supply for locating leaks in the pipe network and for ensuring economical operation. In long-distance heat grids fast localization of leaks in the pipe network is a central point of the monitoring functions. Such a monitoring system must fulfil the requirements of a robust technology and have a very long sensor material life. In the past no acceptable technology was available on the market that satisfied these requirements. Particularly because of the long sensor service life (> 30 years) and the efficient localization of abnormal heat conditions, fibre-optics is an effective solution for monitoring long-distance heat grids. The sensor cable is either embedded in the supply duct during construction work or it is drawn in subsequently. Despite its simple design the fibre-optic cable is resistant to environmental influences and offers a high degree of mechanical protection through an integrated stainless steel tube.

There is a large variety of possible applications, for example, on petroleum and gas pipelines for efficient leak detection and long-time monitoring, for securing dikes/dams, or for monitoring waste sites.