Short Communication Journal of Lasers, Optics & Photonics 2021
Vol.8 No.5

Latest technologies in optical fiber lasers for sensing applications - Rosa Ana Perez Herrera - Universidad Pública de Navarra

Rosa Ana Perez Herrera
Universidad Pública de Navarra, Spain

As it is documented, glass fiber lasers are often used as sensor elements on their own, which supply new possibilities for developing high-performance sensors with compact size when needed and reduced complexity. variety of distributed and point glass fiber lasers are often developed for various sensing applications counting on the technology wont to generate the laser and also counting on the physical or chemical parameter under evaluation. On the opposite hand, glass fiber laser sensors are a number of the foremost reliable and robust laser systems. Taking care of the planning and manufacturing process required to ensure a high level of reliability, inhospitable environments are often easily monitored even once they operate in such harsh conditions like sensing in high-voltage or high-power machinery, or in explosive environments. Also, the increasing interest about structural health monitoring systems has helped to boost the event of novel glass fiber laser technologies for sensing applications. More and more lately developed fiber technologies bring a superior performance to fiber-optic sensing networks.

Tunable FBG-based laser interrogators implemented by several sorts of fiber laser systems, like novel Fourier domain mode locking fiber lasers, or those supported random lasers implemented by means of Raman amplification or maybe erbium doped fiber amplifiers, are demonstrated, both theoretical and experimentally, to be an honest choice to develop new glass fiber laser for sensing applications. During this work, the uses of some advanced photonic technologies that include fiber laser technologies, among others, for fiber sensing applications are presented. Acoustic sensing may be a technology wont to monitor all kind of sensitive locations, from oil & gas pipelines to railway tracks, military bases and international borders. Recently we've also seen that this technology serves for fracking. This technique deploys fibre optic underground and uses sharp pulses of laser light, usually of a narrow band and low phase noise.

When sounds from above are transmitted through the bottom, they cause minuscule vibrations within the cable, and then are often sensed. This is often also used for detecting leaks in off shore pipelines, as fibres sense the changing of acoustic pitch of the encompassing water. Acoustic sensing also can be wont to determine the presence of gas bubbles in oil pipes, which successively are often interpolated into flow data. Measuring temperature; this is often an identical idea to the acoustic sensing. A system pulses laser light through a fibre optic cable and detects the quantity and sort of sunshine reflected back to the unit. By using sophisticated algorithms, this light backscatter is translated into temperature data. Systems can detect change in temperature of but 0.01°C and pinpoint the situation of a thermal event to within one metre. This technique is widely utilized in oil & gas industries to watch in real time down whole temperatures, long pipelines for leaks. The very low power and optical nature of the sensing makes this ideal to be used with hazardous flammable materials or harsh environments like deserts or arctic conditions.

A distributed strain system can accurately locate ground movements near pipelines like landslides, erosion or seismic activity with a resolution of 20 micro strains at 1metre intervals over many kilometres. Strain sensing is additionally wont to monitor underground tunnels or in cities to watch local structures while major close-by excavations could be undertaken. Monitoring is often done continuously with one interrogator watching many channels by employing a combination of circulators & switches or routinely as a part of regular inspections.

Fibre sensing systems can devour tiny vibrations and mix a number of the sensing methods described above. They will be constructed into a variety of intruder detection applications. A fibre are often imbedded into a fence, pipeline or trench and linked to a system which may detect and identify locations of disturbances.

This work is partly presented at 9th International Conference on Optics, Photonics & Lasers July on 02-04, 2019 held at Berlin, Germany