

Article Overview

Malta has implemented advanced fiber-optic sensing through the SENSEI project and local industry, transforming communication networks into distributed environmental and structural monitoring systems.

SENSEI Project: Distributed Environmental Sensing

The University of Malta leads the SENSEI initiative (Smart European Networks for Sensing the Environment and Internet Quality), funded by Horizon Europe with EUR5 million over three years, involving fifteen partners across six EU countries . The project converts existing fiber-optic communication cables into distributed environmental sensors without interrupting data transmission. By leveraging Brillouin and Raman scattering, the system detects strain, temperature, and acoustic disturbances along the fiber. Techniques like BOTDA (Brillouin Optical Time Domain Analysis) provide sub-centimeter spatial resolution over kilometer-scale spans, enabling high-resolution monitoring of seismic activity, sea-level changes, and structural stress points . A notable application includes assessing seismic sensitivity on a submarine optical fiber link between Malta and Catania, Sicily, demonstrating the potential for early warning and environmental monitoring across regional networks . The project also aims to enhance telecommunication network resilience, provide volunteered data streams for predictive maintenance, and improve infrastructure security .

Structural Health Monitoring with Fiber-Optic Sensors

Research in Malta has explored long-gauge fiber-optic sensors for structural health monitoring (SHM), capable of detecting deflections, dynamic characteristics, damages, and loads in civil infrastructure . These sensors, often integrated with carbon fiber elements, offer high precision, durability, and distributed monitoring capabilities. Advanced data processing methods allow three-level structural performance evaluation, combining local and global parameter recognition to support predictive maintenance and safety assessments . Integration with AI and IoT platforms further enhances automated damage detection and intelligent infrastructure management .

Commercial Applications: Sentech Malta FP Ltd

On the industrial side, Sentech Malta FP Ltd manufactures fiber-optic gyroscopes (FOGs), specialized sensors measuring rotational rates for applications ranging from aircraft flight control to professional camera stabilization . The company leveraged prior experience in trading and repairing FOGs to establish a manufacturing base, serving international markets. Their sensors exemplify high-value, precision fiber-optic technology developed locally in Malta, highlighting the country's capability in both research and commercial deployment .

Summary

Malta Fiber Optic Sensor Case Study

Malta's fiber-optic sensor ecosystem combines academic research, EU-funded projects, and industrial expertise. The SENSEI project demonstrates the transformation of communication networks into distributed environmental and seismic sensors, while local research and companies like Sentech Malta FP Ltd showcase structural monitoring and precision sensing applications. Collectively, these initiatives illustrate Malta's leadership in leveraging fiber-optic technology for environmental monitoring, infrastructure safety, and high-precision industrial applications.

In this paper, the working principle of different fiber optic sensing technologies, the development of fiber optic-based

A few-mode optical fiber surface plasmon resonance sensor with graphene layer is investigated, firstly, with the aim of

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Abstract The purpose of this article is to review and further promote the application of optical fiber sensor technology

The system detects intruders using a fiber-optic sensor that is deployed on the perimeter. For fence-protected perimeters.

This study offers an important perspective on the use of distributed optical fiber sensors in the setting up of early

The investigation evaluates the applicability of distributed fibre optic sensors for understanding the early-stage

This study presents a comprehensive review of crack sensing in concrete using distributed fiber optic sensor (DFOS)

Sensors that make use of the unique properties of optical fiber and AI trained on studies and previous case studies can

Over the past two decades, extensive research has been conducted on the application of fiber-optic sensors (FOSs) in structural

Brief theory of sensing principle, fabrication method, applications, advantages and disadvantages of the different fiber

The case studies of four different fiber-optic sensors are presented in this chapter. The first case represents a novel method for

o Methods of installation and optical fibre layout for efficient monitoring of different structures, including their advantages

The objective of this project was to explore a wide range of micro and nano-sensor technologies to achieve unobtrusive, cost

We present the latest works in the design, development, validation and industrial application of geosynthetic materials

Through case studies across key infrastructure domains, including bridges, tunnels, high-rise buildings, pipelines, and

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