FUTURE PHOTONICS

SMART CITIES IS A MASSIVE OPPORTUNITY FOR DISTRIBUTED ACOUSTIC SENSING

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Cities across the globe are turning to the Industry 4.0 in order to optimize their daily operations by using technologies such as sensors, Artificial Intelligence (AI), Internet of Things devices (IoT), cloud computing, cyber-physical systems, big data among other to conduct planning, construction, management, integrated industrialization, informatization, modernization and sustainable development activities.

In this sense, technologies of the Industry 4.0 are creating the new infrastructure of the Smart City. These new technologies allow solving problems of resources utilization and energy efficiency improvement, organize urban production and demographic changes in cities.

As 5G networks in smart cities enable the vision of a truly connected society with its impact being felt across virtually every industry. The next-generation network will require a significantly larger amount of fiber optic base stations because it uses a high-frequency signal that cannot cover large distances. Fiber optic is virtually the unique physical mean that provides the necessary high data transfer rates, which is required for a smart city to carry its daily operations effectively. The demand for fiber optics is expected to sky-rocket in the global optical fiber market.

As a consequence, several players, from tech giants to telecom companies to governments, are working on initiatives to make cities smarter and more efficient. Adding on to the millions of already installed fiber optics, cities around the world are increasing their investments in deploying and spreading new fiber optic networks.

In this sense, DAS Technology is the ideal solution for cities that are seeking to use new forms of technology to operate more efficiently. Distributed Acoustic Sensing (DAS) transforms these fibers into an array of sensors that can monitor an urban and/or remote environment enabling a city to manage its operations more efficiently, save costs and make better-informed decisions. DAS systems turn standard communications fiber found alongside roads, railway lines, power cables and even underwater in seas, lakes or rivers, into a linear set of vibration sensors that can enable a wide range of smart city applications from traffic management and helping improve air quality through to protecting valuable assets.

For instance, by using a fiber cabling network that is under the ground, the DAS sensor can detect movements of vehicles on the road, producing data which can be used to control traffic in an intelligent way. In addition, DAS technology can be used in smart cities to enhance public safety, increase sustainability and improve basic services as it monitors and detects threats, vandalism, average speed, traffic, third party interferences, drilling among others at roads, physical networks and train tracks.

A DAS system sends a coherent laser pulse down an optical fiber and the Rayleigh backscattered light produced whiting the fiber glass acts as a distributed interferometer, thus providing distributed sensing along the whole fiber. The intensity and phase of the returning light is measured as a function of time which is translated to a physical distance, providing long reach (100 km) and high resolution (< 10m) distributed sensing. When a pulse completes a roundtrip time (full fiber length and back), the next laser pulse is then sent, and the process continues. The changes in the reflected intensity or phase between successive laser pulses from the same piece of fiber are driven by the fiber changes (e.g., strain and temperature). The following figure illustrates the DAS principle.

DAS uses signal processing techniques and modern artificial intelligence algorithms to extract valuable information hidden in the massive data continuously collected. These algorithms detect and classify several types of events, which makes DAS suitable for various applications. In addition, both event detection and classification are executed in real--time, allowing a proper response to be

false alarms since the classification is performed with high accuracies and recalls, which means virtually no event goes unnoticed or is incorrectly classified. In this sense, the DAS system is a reliable technology that can be applied to different situations.

As a bottom line, Smart Cities is a massive opportunity for DAS technology where users can make decisions with confidence and assertiveness by identifying events in the early stage, anticipating failure situations and decreasing economic, ecological and social damage. **Future Photonics** offers the ideal solution for expanding profits by increasing productivity, reducing costs and improving customer service. Our world class technology minimizes operational risks and expenses while maximizing the quality and value of the services you provide.