

Fiber Optic Sensing Systems For Critical Applications



Marmon Sensing Solutions

Marmon Sensing Solutions, part of Marmon Engineered Wire & Cable, provides specialized cable products, technology and service solutions that optimize capital asset management, reduce risk and increase reliability while lowering total operating costs. Marmon Engineered Wire & Cable is an interwoven group of 15 companies worldwide and growing, the Marmon Innovation Center and the broadest product line in the industry, focused on breadth of product offerings, technical innovation and progressive manufacturing excellence.

Continuing its commitment to innovation through synergy, Marmon Sensing Solutions introduces fiber optic sensing for customers who wish to monitor, protect and optimize critical capital assets.

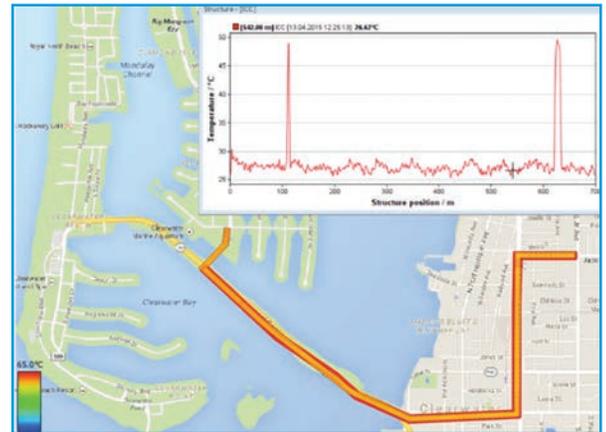
Smart Sensing with Fiber Optics

Facility and infrastructure operators around the world strive to maintain high standards of operational safety and proficiency that allow optimized production and performance while consistently managing overall costs. To do this successfully means reviewing the benefits offered by the latest innovations and deciding which ones offer the best solutions to maintain or surpass existing high standards.

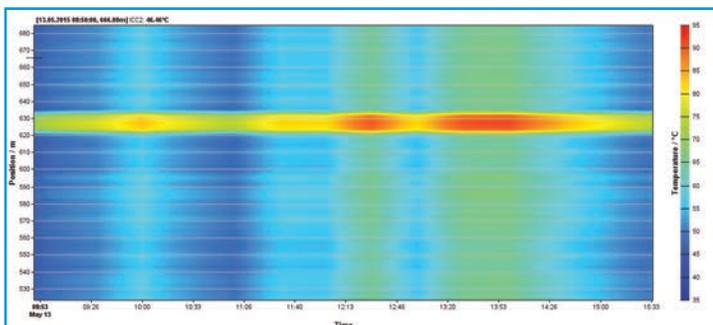
Marmon Sensing Solutions understands this and aims to deliver high-performance life-safety products to help solve the problems that harsh environments raise. Distributed fiber optic sensing is a technology that is recognized as offering reliable and practical sensing solutions to meet these demands. This technology has seen rapid development over the past decade and has proven to be an effective solution for monitoring capital assets and essential operations over long distances as well as in extremely harsh environments.

For these reasons Marmon Sensing Solutions, as part of its 'Innovation Through Synergy' ethos, has introduced fiber optic sensing to complement its range of cables.

The robustness and adaptability of Marmon's fiber optic sensing solutions help protect and maintain complex, challenging critical assets and large infrastructures where traditional monitoring and detection systems may not be appropriate. In some cases, fiber optic sensing adds an additional level of security to existing systems, helping avoid disasters that threaten life and safety as well as disrupting day-to-day production and operations. With Marmon Sensing Solutions' distributed fiber optic sensing systems, it is possible to monitor railway stations and transit tunnels, bridges and dams, oil wells and refineries, nuclear facilities, storage tanks, pipelines, power cables, perimeters and more, all through one sensor and one operating system. Whether for fire detection, cable condition monitoring, pipeline monitoring, preventive/predictive maintenance, perimeter intrusion detection, or for purposes of diagnostics and statistical analysis, distributed fiber optic sensing can deliver valuable information that will mitigate potential risks to safety or operations and assist in optimizing production and performance.



Making Sense of Data Streams



By using a single standard fiber optic cable as a continuous sensing element, Marmon's fiber optic sensing systems record real-time accurate measurements over thousands of meters within seconds to determine critical differences in temperature, strain, acoustics and/or vibration along the entire length of the installed cable. Configuration and visualization software can easily be adapted to a customer's specific needs for processing and displaying these recorded measurements with

various programmable options. This data can then be analyzed and integrated into software platforms that allow for customized visualization, automation, and control of a particular system.



Fire Detection

Marmon Sensing Solutions' Fire Detection system uses linear temperature sensing to identify, locate and monitor a fire event. It can also prevent particular scenarios from turning into catastrophes, by continuously monitoring all events in real-time. The visualization software not only identifies the exact location and size of the fire, but also the direction of the fire spread. Zone views (subdivisions of the fiber cable length, e.g. building sections of the facility or designated deluge zones) 'zoom in' on local temperature or fire events. Programmable features interact with surveillance and suppression systems to ensure an accurate and

effective response. Fire suppression systems can be selectively actuated at the fire location and in the direction of fire propagation. With or without the assistance from integrated surveillance cameras and other monitoring systems, the Marmon system can maximize the fire-fighting agents' accessibility and minimize the overall heat impact in critical areas. Extensive tests have confirmed the efficiency of these combined systems in tunnel fires.

Power Cable Monitoring

Another growing market benefiting from distributed fiber sensing technology is the power and utility industries. Distributed Temperature Sensing (DTS) monitors power cable circuits in energy transmission systems for safe, reliable optimization of power loads along an entire power grid. Accurate knowledge of a power cable's circuit rating condition using continuous real-time monitoring from a DTS system reduces the need for conservative safety margins to be applied within the power cable infrastructure.

User-friendly visualization software can be integrated and customized into an existing operations platform for complete data management and asset control. By optimizing MV and HV cables' permissible load throughout transmission and distribution networks, Marmon's Power Cable Monitoring helps utilize the existing network's energy capacity to its maximum, ultimately reducing operational or renewal costs.



Sensing the Future

Customers will soon be able to benefit from other distributed sensing solutions, designed for smart capital asset security and connectivity.

State of the art security, based on Distributed Acoustic Sensing (DAS) technology, will provide Third Party Interference (TPI) monitoring for any large facilities, airports, refineries, pipelines or other critical infrastructure. Security is essential in various industries where any unwarranted intervention or trespassing into restricted areas could have devastating consequences on critical, ongoing operations. Alarm criteria can be user-configured within zones to avoid resource-consuming false alarms.

Certain environments could cause false alarms in other detection systems resulting in a misallocation of valuable resources. System integration with CCTV and other surveillance equipment can also be customized to ensure an appropriate response to authentic threats.

Marmon Sensing Solutions has the resources and expertise to provide the optimal solution to each of our customers spanning across all major industries. We partner closely with our customers and their engineering support teams to develop the right solution for each project. They are available on a long term, subscription basis, providing immediate customer value with minimal upfront project costs.

With Marmon's fiber optic sensing systems, you are assured of reliable and innovative products and services that also fulfill international quality standards. With 15 companies worldwide and growing, offering the broadest specialty product line in the industry, you can trust Marmon Sensing Solutions to bring you proven, technologically advanced solutions helping you maintain the safety and performance of your facilities and capital assets.



Typical Critical Applications



MSS Overview Brochure v2



A Marmon / Berkshire Hathaway Company