A Copper-Based Fiber Optic Sensing Belt and its Measure Performance for Distributed Engineering Monitoring

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Abstract

The distributed fiber optic sensing techniques for civil and geological engineering monitoring, have some unique advantages with galvanic isolation, EMI immunity, intrinsically safe, passive, small size and lightweight, high sensitivity etc., comparing with the traditional point sensing techniques as resistance gauge and vibrational chord gauge. More and more fiber optic sensing techniques such as Brillouin Optical Time-Domain Reflectometer/ Analysis (BOTDR/A), Ramman Optical Time-Domain Reflectometer (ROTDR) and Fiber Bragg Grating (FBG) have been used in various engineering monitoring. In general, the distributed fiber optic sensing techniques as a engineering monitoring means needs to be usually established a monitoring system, in which the sensing fibers with special coating are usually needed to be developed for structural monitoring.

In this poster, a copper-based fiber optic sensing belt and its products are introduced, which is designed and developed by authors. An extension calibration test and a three-points bending test on an I-beam were carried out to assess its measurement performance. BOTDA and BOTDR were respectively used to measure the extension and bending strain in two tests, and the measured results were compared with the micrometer gauge's ones. The comparative results indicate that there is a good agreement with the real strains of two tests, and validated its feasibility and cost-effective. The copper-based fiber optic sensing belt can be used as a distributed FO sensor into civil and geo- structural safety and health monitoring and has a wide application future.

Keywords: Copper-based fiber optic sensing belt, measuring performance, distributed engineering monitoring, extension test, three-point bending test, BOTDR/A, ROTDR, FBG