Fiber Optic Technology in Structural Health Monitoring for Bridges

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Abstract

Since the development of fiber optic technology for communications in the 1970s, there has been optimism in applying this to sensor technology in the transportation infrastructure. Being intrinsically safe, allowing for extremely long cable runs and immunity to electrical interference and lightening has led to research efforts to bring this technology out into the field on real-world applications. Until recently, these efforts had been primarily research without proven results or the confidence to use fiber optics as the primary technology for structural health monitoring applications.

Fiber optics using Fiber Bragg Grating (FBG) sensing provides point sensing for strain and temperature, and other types of sensors. Depending on sensor quantities and system configuration, this technology becomes not only the economical choice, but provides the other advantages of fiber optics.

Fiber optics using Distributed Strain and Temperature Sensing (DSTS) provides near continuous strain and temperature sensing at one meter spatial resolution over distances as great as 20 km. For measurement of thousands of points over short or long distances, this technology is clearly the economical choice and provides the other advantages of fiber optics.

This paper will focus on two specific types of fiber optics sensing; fiber Bragg grating (FBG) and Distributed Strain and Temperature Sensing (DSTS) and will provide economical comparisons and case studies of this technology currently being used in the bridge market.