

Elasto-magneto-electric (EME) sensors for absolute stress monitoring of steel cables: R&D, Engineering Application, and Product Standard

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ABSTRACT

Absolute stress/force monitoring of prestressing steel cables or tendons is challenging but crucial to the evaluation of the safety of structures in which they are used. To this end, a smart elasto-magneto-electric (EME) sensor based on elasto-magnetic (EM) and magneto-electric (ME) effects is proposed for noncontact field monitoring of the absolute stress in these steel cables. Our research in design, implementation, engineering applications, and product standard of the EME sensory system for non-destructive monitoring of prestressing steel cables is overviewed. The results confirm that the developed EME sensor possesses high repeatability, ease of operation and maintenance, corrosion resistance, and long expected service-life. It is demonstrated that the proposed EME sensory technology is feasible for the stress/force monitoring of prestressing cables in both new and existing structures and the EME sensory system is reliable and stable. The sensors have been applied to more than 60 large-scale Structures such as the 2022 World Cup main stadium in Qatar, The Humen Suspension Bridge in mainland of China, Tseung Kwan O main Bridge in Hong Kong, China and The Bridge of Love River Heart in Taiwan, China. The product standard is going to be published soon to promote the technology progress.

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