

Stevenson Creek Experimental Dam Monitoring Centenary: Overview and Perspectives of Strain Sensing and Strain-Based Monitoring of Civil Structures

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ABSTRACT:

The year 2025 marks the centenary of Stevenson Creek Experimental Dam tests. While the sensors were used in monitoring real civil structures under the test loading since the 19th century, these early sensors measured external changes in the structures, mostly deflections, and relied on direct human access to sensors to read the measurements. To the best of the author's knowledge, the first practical sensor to measure internal changes in civil structures with indirect remote reading capability was strain sensor, and the first such sensor was based on vibrating wire (VW) principle, invented in Germany in 1919.

The Stevenson Creek Experimental Dam Project motivated American scientists to develop, in 1924, a resistive strain sensor consisting of a stack of carbon discs. Several such sensors were embedded in the dam, and the scientists performed reading of the sensors remotely, using wired connections. This 100-year anniversary represents the moment for reflection on advancements in the development of strain sensors for applications in civil structures, and the impact that strain-based monitoring has in the field of structural health monitoring.

The aim of this presentation is to summarize the progress in strain sensing technologies over the last hundred years, overview the techniques for detection of unusual structural behaviors that various strain sensor types enabled, and present perspectives on the future developments related to strain-based monitoring.

