

Assessment of bridge structural performance using advanced SHM systems

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Summary

Structural Health Monitoring (SHM) systems can serve many purposes, by efficiently and reliably providing great quantities of data in relation to any variable of a structure's condition or performance. One such purpose is the provision of the detailed information that may be required in assessing a bridge's condition or structural performance, supplementing the more limited knowledge that can be obtained from traditional inspection methods alone. Examples of the use of SHM systems for this purpose are presented, demonstrating how this approach can enable a detailed understanding of a structure's performance to be developed – for instance, in providing the data required by advanced structural models, and confirming hypotheses relating to the suspected condition and its causes. Thanks to the in-depth understanding of the structure's performance that can be achieved, such systems not only offer an attractive means of completing a bridge inspection, but can further help the service life of a structure to be lengthened and its life-cycle costs to be reduced.

Keywords: structural health monitoring; bridges; condition assessment; structural modelling; diagnosis.

1. Introduction

During inspections of bridges, questions will invariably arise: Do signs which have only recently been observed indicate a serious problem which must be addressed? Should the structure be strengthened to allow for increased traffic loading or ongoing deterioration of its condition? An automated monitoring system, detailed in consultation with a suitably qualified bridge engineer, can provide the data required to enable a sound professional assessment of the bridge's condition to be formulated. The benefits offered by Structural Health Monitoring (SHM) systems for this purpose, and examples of such applications, are presented below.

2. The role that can be played by SHM systems in assessing a structure's performance

A well trained, suitably qualified engineer can tell a great deal about a structure's condition from a visual inspection, and will if necessary be able to apply equipment such as paint film gauges, calipers, optical crack gauges and tiltmeters during the inspection to supplement what can be readily observed. But it should be recognised that a visual inspection should not be relied upon to enable