

BOOK REVIEW / CRITIQUE DE LIVRE

Fibre optics methods for structural health monitoring. By Branko Glisic and Daniele Inaudi. Wiley–Interscience, John Wiley & Sons Inc., 350 Main Street, Malden, MA 02148, USA. 2007. Hardcover; 276 pp. US\$140.00. ISBN-13: 978-0470061428. ISBN-10: 0470061421.

The use of the fibre sensors in structural health monitoring has been growing rapidly in recent years. Through the embedment of fibre sensors in civil engineering structures, such as bridges, buildings, and pipelines, for strain monitoring, one can obtain information on structural changes. The book *Fibre optic methods for structural health monitoring* provides an introduction for the civil engineering professional on how to use fibre sensors to monitor the health condition of civil structures. One unique feature of this book is that it provides many examples of field test results for the applications associated with civil, structural, and geotechnical engineering. It will be an interesting insight to academics as well as to undergraduate and graduate students interested in using fibre sensors for civil structural static monitoring.

The aim of structural health monitoring for civil structures includes: (i) detection of sudden or progressive damages; (ii) evaluation of structural performance under operational conditions or subjected to some specific environmental conditions, such as seismic events or flooding. Strain and stress are the most important mechanical parameters that reflect the structural condition, and they are also the most frequently monitored parameters. The focus of the book is on strain and stress monitoring for civil structures. The authors have developed a method for structural health monitoring by separating the structures into many different parts, and calculating the potential strain or stress of each part using the finite element method under various loading conditions.

They then conducted field tests to measure the strain from different parts of the structures for comparison. The idea is to retrieve the entire structural condition from the sensor readings of different parts of the structures, which allows for the evaluation of the overall structural state of health. The combination of the sensors installed in each structural part is called the sensor topology; the entire sensor system is called sensor network. The measurement of the entire sensor system allows owners to know the overall state of health of

their structures at any given time, thus providing a measure of safety for both private and public structures. This book provides a simulation for calculated strain under different loading conditions for different kinds of bridges using the finite element method. The theoretical background, model development, and calculation are presented.

The book also gives the field tests of strain and stress for different kinds of structures, such as buildings, bridges, dams, tunnels, and pipelines. The common problems encountered in the field are discussed and solutions are offered. The sensor locations are critical to recovering the structural condition; this book gives a few examples to illustrate the procedure through simulation and field test results as well as interpretation of the fibre sensor data, and provides effective feedback to the decision-maker for the civil structures. The reading and interpretation of the sensors are very important, as one must consider the location and measurement length and associate these to the overall condition of the structures.

Thanks to the authors with years of practices in fibre sensor applications for civil structures are provided, as well as thorough collections of intensive field test results.

Fibre sensors have been developed over the past 20 years, during which there have been a few books written that have focused on sensor technology deployment. This book is different in that it provides civil engineering professionals with training in the concepts of structural health monitoring on civil structures and builds a solid foundation for using the fibre sensors to serve this purpose, and also provides a cost-effective monitoring tool for various civil structures from the viewpoint of the structures, rather than from individual tests of the parts of the structures. This makes the book extremely useful for structural inspectors who need to understand the condition of civil structures from a structural perspective. Based on this, it can help them to reach correct evaluations of the true condition of the structures, and in turn helps them make effective decisions on the final fate of these structures.

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Received 19 February 2008. Accepted 19 February 2008. Published on the NRC Research Press Web site at cjce.nrc.ca on 30 July 2008.