Preface

Structural health monitoring (SHM) involves introducing a sensor, or an array of sensors, into an engineered structure to monitor it periodically for structural degradation due to its operating environment. The sensors provide nondestructive measurements to give information about critical structural properties, such as wall thickness measurements for corrosion detection, crack initiation or growth monitoring for welds susceptible to cracking, vibration monitoring of a structure that is susceptible to fatigue, and stress measurements for structures where either peak stresses or detailed stress measurements must be monitored. This data is then statistically analyzed to determine the current health of the structure, to estimate its remaining life, and to allow decisions to be made for follow-up maintenance.

SHM is a multidisciplinary field that is currently changing rapidly due to technological advances, and one that currently does not have well-established standardization. It is an important field for the IIW, as all welded or otherwise joined structures require monitoring to extend their lifetimes and to ensure continued safe operation.

Commissions V (Non-destructive Testing and Quality Assurance of Welded Products), XI (Pressure Vessels, Boilers and Pipelines), XIII (Fatigue of Welded Components and Structures), and XV (Design, Analysis and Fabrication of Welded Structures) held a joint seminar during 68th IIW annual assembly 2015 in Helsinki (Finland) on this important subject. Many countries and industries around the world are managing aging infrastructure, and examining ways of extending life within economic constraints and requirements for public and environmental safety. The attendance by over 60 representatives from 17 countries demonstrated the importance of this forum and the knowledge shared by attendees.

Papers were presented in the area of sensor development, including macro-fiber composite sensors for crack detection and optical fiber Bragg gratings for flaw detection. The use of welds itself in the structure as SHM sensors and simulation to determine the probability of detection for different SHM sensor configurations were also discussed. SHM methods based on vibration signal variations to detect small defects in composite components or to monitor large structures (hull of a container ship) were considered. There were also application-specific papers describing SHM

applied to industrial components such as a nuclear boiler support spine, an industrial press, and corrosion monitoring of pipes.

This booklet gathers together several papers related to presentations made during this joint SHM seminar. It will allow for the attendees to go further on the subject than what has been presented during the seminar and for the other readers to discover recent developments in that discipline. Following the success of this first seminar, IIW will continue to have involvement in SHM through seminars and joint commission activities.

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