INSPIRE University Transportation Center Presents

Probability of Detection in Structural Health Monitoring
A FREE WEBINAR
March 22, 2023, 10:00 AM – 11:00 AM Central Time (US and Canada)
~[REGISTER HERE](#)~

Abstract

The fundamental concept of the probability of detection in structural health monitoring is introduced. The traditional Probability of Detection (POD) method as described in the Department of Defense Handbook MIL-HDBK-1823A for nondestructive evaluation systems does not take the time dependency of data collection into account. When applied to in-situ sensors for the measurement of flaw sizes, such as fatigue-induced crack length and corrosion-induced mass loss, the validity and reliability of the traditional method is unknown. In this 50-minute lecture, the POD for in-situ sensors and their associated reliability assessment for detectable flaw sizes are evaluated using a Flaw-Size-at-Detection (FSaD) method and a Random Effects Generalization (REG) model. Although applicable to other sensors, this presentation is focused on long period fiber gratings (LPFG) corrosion sensors with thin Fe-C coatings. The FSaD method uses corrosion-induced mass losses when successfully detected from different sensors for the first time, while the REG model considers the randomness and difference between mass loss datasets from different sensors. The Fe-C coated LPFG sensors were tested in 3.5 wt.% NaCl solution until the resonant wavelength of transmission spectra no longer changed or the Fe-C coating was oxidized completely. The wavelength shift of 70% of the tested sensors ranged from 6 to 10 nm. In comparison with the FSaD method, the REG method is more robust to any departure from model assumptions since significantly more data are used in the REG method.

Speaker:
Genda Chen, Ph.D., P.E., F. ASCE, F. SEI, F. ISHMI, F. SPIE
Professor and Abbett Distinguished Chair in Civil Engineering (https://care.mst.edu)
Director, Center for Intelligent Infrastructure (https://cii.mst.edu)
Director, INSPIRE University Transportation Center (https://inspire-utc.mst.edu)
Associate Director, Mid-America Transportation Center (https://matc.unl.edu)
Missouri University of Science and Technology (https://www.mst.edu)
Tel: (573) 341-4462; Email: gchen@mst.edu; URL: http://web.mst.edu/~gchen/

For more information, visit http://inspire-utc.mst.edu/webinars/.