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Development of Dual PZT Based Impedance Measurement Techniques for Large-Scale Structures

Дрезден, Германия, 2012 год

8 стр; формат: 23,5 x 16 см; библиографический список: 7 единиц

Код: 10850

In this study, new impedance measurement techniques are developed specially for structural health monitoring of large-scale structures. Electromechanical (EM) impedance based damage detection techniques, which utilize the electromechanical coupling effect between a piezoelectric transducer such as lead zirconate titanate (PZT) and a host structure, have been shown to be very sensitive to local damage near the PZT. However, when the impedance of the host structure becomes excessively large compared to that of the PZT, the impedance measurement becomes difficult. This impedance mismatch has been hampering the application of the impedance based damage detection techniques to large-scale structures. In this study, new impedance measurement techniques are developed for impedance measurement of large-scale structures using a dual PZT transducer, which is composed of two separate but concentric PZT segments. Impedance signals obtained by the proposed techniques are compared to those measured by conventional self-sensing circuit and commercial impedance analyzer. It is demonstrated that the proposed techniques can successfully measure the EM impedance of areal-scale bridge structure even then the conventional techniques fail to do so.

Доклад. 6-я Европейская конференция по мониторингу технического состояния сооружений, 2012. Редакция Кристиана Боллера.

Ключевые слова:

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