

Real-Time Compressive Strength Monitoring for NPP Concrete Construction Using an Embedded Piezoelectric Self-Sensing Technique

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Abstract : Recently, demands for the construction of Nuclear Power Plants (NPP) using high strength concrete (HSC) has been increased. However, HSC might be susceptible to brittle fracture if the curing process is inadequate. To prevent unexpected collapse during and after the construction of HSC structures, it is essential to confirm the strength development of HSC during the curing process. However, several traditional strength-measuring methods are not effective and practical. In this study, a novel method to estimate the strength development of HSC based on electromechanical impedance (EMI) measurements using an embedded piezoelectric sensor is proposed. The EMI of NPP concrete specimen was tracked to monitor the strength development. In addition, cross-correlation coefficient was applied in sequence to examine the trend of the impedance variations more quantitatively. The results confirmed that the proposed technique can be applied successfully monitoring of the strength development during the curing process of HSC structures.

Keywords : concrete curing, embedded piezoelectric sensor, high strength concrete, nuclear power plant, self-sensing impedance

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