15th INTERNATIONAL CONFERENCE
Dynamical Systems — Theory and Applications
December 2-5, 2019. Lodz, POLAND.

DSTA 2019

paper id: VIB53

Electromechanical impedance tomography for strand breakage localization in multi-strands anchorage

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Abstract: So far, vibration-based damage detection studies have focused mostly on globally assessing the prestress loss in tendon-anchorage system. For the tendon-anchorage with multi-strands, damage can occur at any local strands. Thus, the localization of damaged strands should be accurately estimated for the integrity of the entire system. As a local vibration approach, in this study, an electromechanical impedance-based method is presented for strand breakage detection in multi-strand anchorage systems. Firstly, stress fields of a multi-strand anchorage are analyzed to examine anchorage's responses sensitive to local strand breakage. Secondly, an impedance-based stress monitoring technique via the PZT interface which is designed for the multi-strand anchorage to monitor stress variations induced by the strand breakage. Local dynamic responses of the hoop-type PZT interface are analyzed to predetermine the effective frequency ranges. Finally, the feasibility of the proposed method is verified for a 9-strands anchorage system under various strand breakage cases. Variations in impedance responses are quantified, and broken strands are localized by linear tomography analysis of damage indices.

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