

EVALUATING THE SEVERITY OF TRANSVERSE CRACKS IN BEAM-LIKE STRUCTURES BY USING AN LOSS ENERGY METHOD

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ABSTRACT

Over functioning time, structures can be affected by multiple types of damages caused by fatigue, improper production methods or due to exceeding loads. The current paper describes a method for evaluating the severity of transverse cracks that are present in beam-like structures based on changes in the natural frequencies. Because the presence of a damage has a negative impact on the energy that a beam can store in the affected section, it is possible to find the influence of the crack on any other position along the beam, considering the stored normalized energy in that location. The technique is based on a mathematical relationship that provides the exact solution to the frequency changes of the bending vibration modes, taking into account two terms. The first term is related to the tensile energy stored in the beam, and the second term considers the increase of flexibility due to cracks, for this reason, damage assessment is performed in two stages; first, the location of the crack is found and then an assessment of its severity is performed. In this study, the aim is to test the developed method for estimating the severity of transverse cracks for different sections and lengths of beams.

Keywords: damage detection, transverse crack, deflection, structural health monitoring, stiffness reduction