

VIBRATION BASED METHOD FOR SHAFT CRACK DETECTION

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ABSTRACT

Various excitation techniques have been developed to extract information on dynamic state of rotating machinery. This paper will address the effectiveness of selected excitations and analysed signals towards health monitoring of rotating machines from the cracked shaft dynamics point of view. The computer simulation study is based on the uncracked and cracked Jeffcott rotor models and the efficiency of the selected approaches is examined. As the excitation we have considered the rotor unbalance, additional harmonic forces, and input conditions. The combined resonances as diagnostic indicators of the crack in the shaft can be clearly seen in the total frequency spectrum being the difference between the spectrum of cracked and uncracked shaft. The introduced model of the rotor is convenient for application of various signal processing methods for crack detection and evaluation of its depth. Furthermore, in such a model one can take into account number of excitation planes and directions of the applied forces and can select the type of analyzed response (e.g. transient, steady-state).

Keywords: Health monitoring, crack, excitation techniques, Jeffcott rotor.