

## CRACK IDENTIFICATION OF A ROTATING SHAFT WITH INTEGRATED WIRELESS SENSOR

F. Andrés Bejarano, Yi Jia<sup>\*</sup>, Frederick Just

Department of Mechanical Engineering

University of Puerto Rico, Mayaguez Campus

PO Box 9045, Mayagüez, Puerto Rico 00681-9045, USA

Emails: [jia0@me.uprm.edu](mailto:jia0@me.uprm.edu)

**Abstract-** This paper presents a novel real-time crack identification method to determine the position and depth of a transverse open crack on a rotating shaft. A newly developed wireless sensor capable of being mounted directly on the shaft is employed to monitor acceleration at different points of the shaft in a rotating coordinate system. The vibration parameters obtained from the wireless sensors and Finite Element Model provide operational data to perform Modal Analysis with different mock crack positions and depths, and a unique relation between the vibration parameters and crack characteristics is developed by Neural Networks Method working as function approximator to predict the crack size and location on the shaft. The method was experimentally validated and results have shown that the crack detection sensitivity parameters depend on the acceleration signals at different points of the shaft.

**Index terms:** crack detection, wireless sensor, vibration modal analysis, finite element method, neural Networks, rotating shaft.