ISSN 2395-1621

Study About of Faults Detection Cracked Beam

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ABSTRACT

In this paper we have presented the study of Different theoretical, experimental and mathematical model approaches with a variety of numerical analysis techniques and procedures carried out by previous researchers for fault detectionof a cracked beam. Different methods studied in the current research to locate, position and size of crack of a crackedstructure i.e. using compliance matrix methods , Euler-type finite elements method, Monte Carlo method, finite elementanalysis, the formula of vibration analysis, ANSYS, curve for amplitude deviation, curve for slope deviation, continuous wavelet transforms, wavelet evaluation technique, model of Rayleigh beamelements, by using the Newton–Raphson method, beam fault recognition by strain energy model, nondestructive testing , Artificial Intelligence Techniques.

ARTICLE INFO

Article History

Received :15th April 2016

Received in revised form :

17th April 2016

Accepted : 19th April 2016

Published online :

23rd April 2016

Keyword: fault, detection, cracked, beam, crack, compliance.

I. INTRODUCTION

The Beams are well-known structures used to take and shift high loads in machines and civil structures, and fault is the main cause of structural failure. Unpredicted failure for the period of high load process could be terrible, so before time crack detection is very essential. Non-destructive inspection techniques are generally used to investigate the critical changes in the structural parameters, so that an unexpected failure can be predicted. Damage can be detected, quantified and localized by on-line damage assessment techniques, through measuring vibration parameters, which indicate the global conditions of the structures. In general a crack causes a decrease in the stiffness and enhance in the damping of the structure. Location of crack through the method of vibration signature is great advantages over traditional methods. Present approach can make it easier to find out the position and crack size of cracked beam structure by the putting of data accumulated from the vibration signature. The crack grew in the structure produces flexibility at the locale of crack which results a contraction of natural frequency and the modification in the mode of shape. From this, it may clear that by measuring and putting the vibration factor can be work out the place and intensity of the crack of cracked beam. Here, various methods and numerical models carried out by many authors are studied to evaluate location of crack, position and size of cracked structure. Paris et al. [1]have written the idea for find out of compliance matrix for different types of beams. Datta et al. [2] have worked dynamic uncertainty action of tapered bars with defect supported on an elastic foundation. They have studied the parametric uncertainty behaviour of a non-prismatic bar with local zones of damage and supported on an elastic foundation by using a finite element analysis. They have concluded with the presence of damage has a marked effect on the static buckling load, 52 Pankaj Charan Jena, Dayal R. Parhi and Goutam Pohit natural frequency and dynamic uncertainty zones of the bar and a defect in the beam in the neighborhood of the narrow end affects the static and dynamic behaviour more than one close to the wider end. Sekhar et al. [3] have given a method to calculate the vibration character by applying model based finite element analysis (FEA). Ruotolo et al. [4] have calculated vibration parameter of a cantilevered Beam by studying its harmonic behavior of the vibrations with a close Crack by using a finite element model of beam. They have used Euler-type finite elements with two nodes and 2 D.F (transverse displacement and rotation) at each node for safe parts of the beam and absolute to use the first and higher order harmonics of the response to a harmonic forcing in order to differentiate the non-linear behaviour of the cracked beam. Takahashi [5] has presented of the vibration and potency of a non-uniform cracked Timoshenko beam subjected to a lateral follower strength distributed above the middle line by use of the transfer matrix approach. He has written the main equations of the beam as a coupled set of first-order differential equations by using the transfer matrix of the beam. His method has applied to beams with linearly changeable radii, subjected to a exact follower strength, and the usual frequencies and flutter loads are calculated numerically, to provide information about the fault. Cacciola et al. [6] have examined the vibration respond of a beam with an edging non propagating fault by means of stochastic study, in order to notice the existence and the site of structural damage. They have applied Monte Carlo method to assess in time domain the higher order statistics of the nonlinear beam modeled by finite elements. The mathematical application performed on a cantilever beam shows high sensitivity of the tilt coefficient of the rotating degrees of freedom to the non-linear behaviour of the structure. Dharmarajua et al. [7] have proposed a general classification algorithm to approximate crack elasticity coefficients and the crack deepness based on the strength response information. They have told that algorithm exercise the set dynamic reduction scheme to eradicate some of the degrees of freedom (DOF) of the structure. The Euler–Bernoulli beam has used in the finite element modelling for abolish the rotational DOF at fault component nodes, a novel hybrid reduction idea which outlined has based on the physical assumption of their problem.

II. LITERATURE REVIEW

Nahvi et al. [8] have worked a logical, as well as tentative approach to the fault recognition in cantilever beams by vibration study. They have designed a experimental setup in which a cracked cantilever beam has thrilled by a mallet and they have obtained the response by means of an accelerometer attached to the beam. To evade nonlinearity, they have assumed that the crack is always open. To see the fault, contours of the normalized frequency in terms of the normalized fault depth and location have plotted.

Chondros et al. [9] have studied the torsional vibration of a circumferentially cracked cylindrical beam through a correct methodical result and a mathematical finite element investigation. They have applied the formula of Hu-Washizu-Barr vibration to formulate the differential calculus equation and boundary situations of the cracked beam. After that they have used Rayleigh quotient method to analyze natural frequencies of the cracked beam. After that they developed three dimensional solid finite element model of the cracked beam.

Al-Said [10] has studied a simple algorithm based on a mathematical model which was proposed to recognize crack place and intensity in a stepped cantilever Euler–Bernoulli beam carrying a unyielding disk at its tip. In his mathematical model he has explained the lateral vibration of the beam and derived an equation by using the assumed mode method that coalesces with the Lagrange's equation. He has used a massless torsional spring whose rigidity depend on the severity of the crack and by means of that crack modeling method combined with the assumed mode method, the crack effect has introduced to the structure elasticity as global additional structural elasticity. The proposed identification algorithm utilized the first three natural frequencies shift of the beam 'Study about of Faults Detection of a Single Cracked Beam through Various Technique' 53 caused by a crack to estimate its place and depth. In addition, the proposed mathematical model has used to exemplify the outcome of the crack depth and its place on the dynamic character of the system. Using the commercial finite element (FE) software (ANSYS 8.0), three-dimensional finite element analysis (FEA) has carried out to show the truth of the derived mathematical model and to exhibit the dependability of the projected crack recognition algorithm.

III. CONCLUSION

From the above various way of investigation for identification of fault, its place and size of crack of a cracked beam is studied properly. It is concluded that the future work on the problem of fault recognition of a cracked beam can be carry by using more advanced hybrid techniques i.e. by vibration signature with finite element method and artificial intelligence.

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