Accepted Manuscript

Quantitative Evaluation of Surface Crack Depth with Laser Spot Thermography

Jinxing Qiu, Cuixiang Pei, Haochen Liu, Zhenmao Chen

PII: S0142-1123(17)30086-5
DOI: http://dx.doi.org/10.1016/j.ijfatigue.2017.02.027
Reference: JIJF 4263

To appear in: *International Journal of Fatigue*

Received Date: 19 January 2017
Revised Date: 23 February 2017
Accepted Date: 26 February 2017

Please cite this article as: Qiu, J., Pei, C., Liu, H., Chen, Z., Quantitative Evaluation of Surface Crack Depth with Laser Spot Thermography, *International Journal of Fatigue* (2017), doi: http://dx.doi.org/10.1016/j.ijfatigue.2017.02.027

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Quantitative Evaluation of Surface Crack Depth with Laser Spot Thermography

Jinxing Qiu, Cuixiang Pei*, Haochen Liu and Zhenmao Chen*

State Key Laboratory for Strength and Vibration of Mechanical Structures,

Shaanxi Engineering Research Center of NDT and Structural Integrity Evaluation,

Xi'an Jiaotong University, Xi'an, China

Abstract

In this study, a numerical method based on finite element method (FEM) is developed to simulate the heat flow generated by laser spot source and investigate the relationship between crack size and temperature distribution. The feasibility of the simulation method is validated by experiments both in time and spatial domains. The simulation and experiment results also show that the crack depth can be described by two characteristic parameters. Furthermore, a quantitative retrieval method based on neural network is developed for the crack depth evaluation by using the parameters. By using the proposed method, crack depth can be determined only by analyzing measured surface temperature values.

Keywords: Laser spot thermography; Surface crack; Quantitative evaluation; Neural network

1. Introduction

Detection of surface breaking cracks is an important task to ensure the safe operation of the key structures like nuclear plants. Besides the widely used NDT techniques, such as ultrasonic testing (UT) and eddy current testing (ECT), laser spot thermography (LST) is a novel remote inspection

* Corresponding authors.
Email address: pei.cx@mail.xjtu.edu.cn (C. Pei); chenzm@mail.xjtu.edu.cn (Z. Chen).

ACCEPTED MANUSCRIPT

Download English Version:

https://daneshyari.com/en/article/5015082

Download Persian Version:

https://daneshyari.com/article/5015082

Daneshyari.com