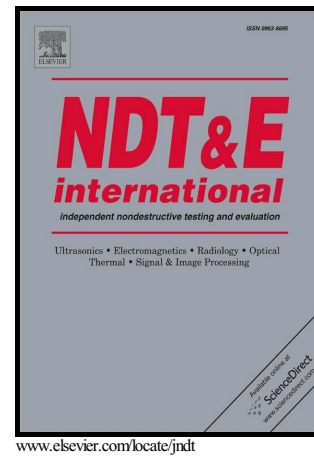


Author's Accepted Manuscript

Pulsed Eddy Current Thickness Measurement Using Phase Features Immune to Liftoff Effect

Mengbao Fan, Binghua Cao, Ali Imam Sunny, Wei
Li, Guiyun Tian, Bo Ye



PII: S0963-8695(16)30261-4
DOI: <http://dx.doi.org/10.1016/j.ndteint.2016.12.003>
Reference: JNDT1821

To appear in: *NDT and E International*

Received date: 11 February 2016
Revised date: 12 November 2016
Accepted date: 11 December 2016

Cite this article as: Mengbao Fan, Binghua Cao, Ali Imam Sunny, Wei Li, Guiyun Tian and Bo Ye, Pulsed Eddy Current Thickness Measurement Using Phase Features Immune to Liftoff Effect, *NDT and E International*, <http://dx.doi.org/10.1016/j.ndteint.2016.12.003>

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 galley proof before it is published in its final citable 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.

Pulsed Eddy Current Thickness Measurement Using Phase Features Immune to Liftoff Effect

Mengbao Fan¹, Binghua Cao^{2*}, Ali Imam Sunny³, Wei Li¹, Guiyun Tian³ and Bo Ye⁴

¹ School of Mechatronic Engineering, China University of Mining and Technology, Xuzhou 221116, P.R. China;

² School of Information and Electrical Engineering, China University of Mining and Technology, Xuzhou 221116, P.R. China;

³ School of Electrical and Electronic Engineering, Newcastle University, Newcastle upon Tyne NE1 7RU, UK;

⁴ Faculty of Electric Power Engineering, Kunming University of Science and Technology, Kunming 650500, P.R. China.

Abstract: Conventionally, peak value and peak time are extracted from pulsed eddy current (PEC) response as features for thickness measurement. However, they suffer from lift-off variations. In this work, the phase of spectral PEC response from a Hall sensor are proposed to serve as robust features for thickness evaluation. The presented novel features are immune to lift-off effect, because phase signals remain nearly constant against lift-off variations. An analytical model was formulated, and simulations were performed to uncover the physics of the characteristics of the phase feature and establish the relationship between the phase feature and sample thickness. Experiments were carried out to validate the proposed phase feature. Eventually, the proposed phase feature was evaluated for accurate thickness measurement and some key factors were discussed.

Keywords: Pulsed eddy current; nondestructive testing; lift-off; phase; spectral response; thickness measurement; metallic plate

1 Introduction

Eddy current (EC) method has been employed to measure the thickness of a conducting plate in industries to ensure the quality of products or evaluate wall thinning of in-service parts due to corrosion ^[1,2]. M. Fan adopted a model-based method to infer multiple parameters simultaneously including lift-off distance ^[3]. However, model-based method is time-consuming and requires excellent agreement between theoretical and experimental results. The slope of a lift-off curve in the impedance plane which is phase signature in nature is

Download English Version:

<https://daneshyari.com/en/article/4925194>

Download Persian Version:

<https://daneshyari.com/article/4925194>

[Daneshyari.com](https://daneshyari.com)