Applications of Spectral Behaviour of Pulsed Eddy Current NDE

Guiyun TIAN 1,2, Yunze HE 1,3, Ibukun ADEWALE 1, Anthony SIMM 1

1 School of Electrical and Electronic Engineering, Newcastle University, Newcastle upon Tyne, NE1 7RU, United Kingdom. Email: g.y.tian@ncl.ac.uk
2 State Key Laboratory of Mechanical Transmission, Chongqing University, China
3 National University of Defense Technology, Changsha 410073, P. R. China

Abstract

The pulsed eddy current (PEC) technique acquires data over a wide range of frequencies; therefore, it contains more information than traditional EC inspection in the frequency domain. This paper investigates the spectral behaviour of PEC under varying lift-offs, material properties (such as conductivity, permeability) and directional stress.

In previous PEC work, the analysis usually focused on the time response signal, extracting features such as peak values and rising times [1]. In this paper, we propose and investigate the spectral behaviour of $\Delta B_{\text{norm}}$, which has previously been used in the time-domain to measure stress [2] and to characterise corrosion [3], to improve the PEC approach. Firstly, the intrinsic response from material properties of interest are obtained, then, the spectral behaviour of the intrinsic response is investigated by the analysis of magnitude spectrum, as illustrated in Figure 1 for conductivity and permeability variation.

![Figure 1 Spectral Patterns for various material properties](image)

Keywords: Pulsed eddy current, Spectral, Normalisation, Stress, Lift-off, Conductivity, Permeability.

References