Presented at NDE2002, to predict. assure. improve. www.nde2002.org
National Seminar of ISNT, the Indian Society for Non Destructive Testing
Hotel Taj Connemara and Raja Muthiah Hall, Chennai, 05. – 07. 12. 2002

Wavelet Transform Based Method for Eddy Current Testing of Cladding Tubes

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Abstract

In eddy current testing, variations in geometry, electrical conductivity and magnetic permeability produce disturbing signals and hence, influence the defect detection capability. To improve the situation, various signal processing methods such as Fourier Transform, Deconvolution, Fourier descriptor etc., are applied to eddy current signals. In this paper, a method based on the most recent time-frequency analysis technique called Wavelet Transform (WT) is proposed to suppress the disturbing signals and to enhance the signal to noise ratio (SNR).

In this method, de-noising feature of the WT is incorporated to improve defect detection capability. This method essentially consists of three steps namely, decomposition, de-noising and reconstruction. This method is applied to eddy current signals from a) FBTR fuel cladding tubes with periodic wall thickness variations that produce continuous disturbing signals during eddy current testing and b) stainless steel plates with defects and conductivity variations. In case of cladding tubes, this method has successfully suppressed the disturbing signals due to periodic wall thickness variations and detected notches of 0.08 mm deep and holes of 0.3 mm diameter with a SNR better than 20 dB. Similarly, in the case of stainless steel plates, the method could detect EDM notches deeper than 0.2 mm. Introduction to wavelet transforms, details of the method developed and its application to eddy current testing of cladding tubes and stainless steel plates are covered in this paper.

Key words: Eddy current testing, signal processing, wavelet transform, signal to noise ratio, defect detection.