Abstract

Inspection of structural materials is an important aspect in many industrial applications. Ultrasonic Non-Destructive Testing (NDT) is one of the most widely used techniques in this aspect. Conventional pulse echo and through transmission methods in Ultrasonic Testing (UT) are not reliable in detection of defects with random orientation due to its reflection principle. Time of Flight Diffraction (ToFD) method has gained more popularity in this area in the recent past. It uses diffraction energy and has more advantages in detection, sizing and positioning of the defects irrespective of type, orientation and characteristics. This technique is hampered by several of the unwanted signals arising due to ultrasonic interaction with the material grains. This noise affects the visibility of a defect signal especially when the defect size is small. Many signal processing techniques such as split spectrum processing, wavelet transform and correlation etc are available for de-noising of signals. Among this Discrete Wavelet Transform (DWT) is widely used due to its added advantage of time-frequency information simultaneously. Stationary Wavelet Transform (SWT) is a form of DWT with the main difference that it is translation invariant unlike DWT. In this paper SWT has been used for de-noising of the real time ultrasonic ToFD signals from austenitic stainless steel welds and its performance is
De-noising of ToFD Signals from Austenitic Stainless Steel Welds using Stationary Wavelet Transform

compared with that of the DWT.

References

- V. L. Newhouse, N. M. Bilgahtay, J. Saniee, and E. S. Furgason, "Flaw-to-grain echo enhancement by split-spectrum processing," Ultrasonics, March 1982, pp. 59-68
- Ogilvy J. A. and Temple J. A. G., "Diffractive of elastic waves by cracks:
De-noising of ToFD Signals from Austenitic Stainless Steel Welds using Stationary Wavelet Transform

Application of time of flight inspection\textquoteright;, Ultrasonics, Nov. 1983, pp. 259-268.
- C. Lázaro, J. L. San Emeterio and A. Ramos, \textquoteright;Noise Reduction in Ultrasonic NDT using Discrete Wavelet Transform Processing\textquoteright;, IEEE Ultrasonic Symposium, Spain, 2002, pp. 777-780
- Vaclav Matz, Radislav Smid, Stanislav starman, Marcel Kreidi, \textquoteright;Signal-to-noise ratio enhancement based on wavelet filtering in ultrasonic testing\textquoteright;, Ultrasonics, ELSEVIER, Czech Republic, 2009, Vol. 49, pp. 752-759.
- Yuan Chen, Hongwei Ma, \textquoteright;Application of wavelet analysis to signal de-noising in ultrasonic testing of welding flaws\textquoteright;, 17th World Conference on Nondestructive Testing, Shanghai, China, 2008.
- Erdal Oruklu and Jafar Saniie, \textquoteright;Ultrasonic flaw detection using Discrete Wavelet Transform for NDT applications\textquoteright;, IEEE Ultrasonic Symposium, Chicago, 2004, pp. 1054-1057.
- Zhen-zhu Yu, Chong Zhao, Wei Ma, \textquoteright;Application of the Wavelet Transform in Ultrasonic Echo Signal Processing\textquoteright;, IEEE Computer Society, Beijing, China, 2009, pp. 576-579.
- Prasanna Karpur and Orlando J. Canelones, \textquoteright;Split spectrum processing: a new filtering approach for improved signal-to-noise ratio enhancement of ultrasonic signals\textquoteright;, Ultrasonics, USA, 1992, Vol. 30, No. 6, pp. 351-357.

Index Terms

Computer Science
Signal Processing

Keywords
Stationary Wavelet Transform Discrete Wavelet Transform De-noising Signal-to-Noise ratio