Abstract

Austenitic stainless steel has structural values in almost all industries. It is one of the most widely used materials. Qualitative assessment of such important components is of greater importance in very sensitive applications such as nuclear reactor vessels. Ultrasonic based Time of Flight diffraction is a reliable technique in testing the materials for many types of defects in welds. Echo signals obtained by the receiver are also accompanied by ambient scattering noise due to the signal interaction with the grains of the material. This noise degrades the quality of the defect echo signal and at times completely deteriorates the shape of the defect signal thereby making it unsuitable for characterization. Signal processing is a necessary aspect in restoring the defect signal’s shape, size etc for proper detection and positioning of the defect in the material. Wavelet Transform is one such popular technique for de-noising of the signals in which thresholding of high frequency components removes the unwanted noise. Conventional global thresholding gives good improvement in SNR values. This paper implements an Interval dependant thresholding method and it is found that it has very good improvement in SNR values compared to conventional techniques.
Interval Dependant Thresholding based De-noising of Ultrasonic TOFD Signals from Austenitic Stainless Steel Welds

References

- V. L. Newhouse, N. M. Bilgutay, J. Saniie and E. S. Furgason, "Flaw-to-grain echo enhancement by split spectrum processing"; Ultrasonics, March 1982, pp. 59-68.
- Scott E Bailey, "Implementing SSP in TMS320c26"; Texas Instruments, 1997.
- Silk M. G., "An evaluation of the performance of the TOFD techniques as a means of sizing flaws, with particular reference to flaws with curved profiles"; Insight vol. 38, No. 4, April, 1996.
- Predrag Duki?, Ines Duki?, "Advantages of ultrasonic time of flight diffraction technique and R6 structural integrity assessment procedure for nuclear power plant components"; International Conference Nuclear Energy in Central Europe 2000, Slovenia

- J. C. Lázaro, J. L. San Emeterio and A. Ramos, "Noise Reduction in Ultrasonic
NDT using Discrete Wavelet Transform Processing, IEEE Ultrasonic Symposium, Spain, 2002, pg no. 777-780
- Yuan Chen, Hongwei Ma, "Application of wavelet analysis to signal de-noising in ultrasonic testing of welding flaws", 17th World Conference on Nondestructive Testing, Shanghai, China, 2008
- Gaohua Liao, Junmei Xi, "Ultrasonic Testing Signal Processing of Weld Flaw Based on the Second Generation Wavelet", 9th International Conference on Hybrid Intelligent Systems, Nanchang, China, 2009
- Xianfeng Fan, Ming J Zuo, and Xiaodong Wang, "Application of Stationary Wavelet Transforms to Ultrasonic Crack Detection", IEEE, Canada

**Index Terms**

Computer Science
Signal Processing

**Keywords**

Interval Dependant Thresholding, TOFD, Discrete Wavelet Transform
Signal-to-Noise Ratio