Abstract

The Pulse Echo (PE) technique is a widely used ultrasonic non destructive testing technique to test materials by analyzing ultrasound echoes reflected from flaws and discontinuities. In conventional PE technique, called contact type PE, an ultrasonic transducer is in constant contact with a test piece, transmitting and receiving ultrasonic signals from the test
Development of a Virtual Instrument for Immersion Type Ultrasonic Inspection with a Computer Controlled Multi-Axis Motion Controller

specimen. The inherent shortcomings of PE are the need for; uniform couplant conditions, the ultrasonic transducer to remain in contact with the test object throughout the scan and a limitation to scan regular surfaced objects only. This paper provides for extending a system initially developed for contact type PE, to perform Immersion Testing (IT) which is a contactless pulse-echo inspection method with the probe and test piece separated by a predetermined volume of water of certain thickness. A computer controlled 3-axis transducer position manipulator (motion frame) is constructed for assistance in conducting automated tests. The efficacy of immersion testing relies on the precise control of the motion of transducer. The existing immersion type motion controllers along with dedicated data acquisition and analysis system are quite expensive and are beyond the affordability of smaller ultrasonic labs. Hence the proposed system including the motion frame and Data Acquisition Unit (DAQ) can serve as a competent, low-cost and reliable IT system benefitting several small scale industries and labs.

Reference

- Practical Ultrasonics by C.V. Subramaniam, Indian Society for Non-Destructive Testing, National Certification Board of Sciences, Narosa Publications.
- Ultrasonic testing of materials at level-I, IAEA, Vienna 1999.
- Ultrasonic testing of materials at level-II, IAEA, Vienna 1999.
- Tatiana MARTIN, Stefan KNAAK, Jarir AKTAA, Immersion Ultrasonic Testing on EUROFER Welded Joints for Determination of the Minimum Detectable Flaw Size, DGZfP-Jahrestagung 2010 - Di.2.B.2
- Dipl.-Ing. Matthias SCHWABE, Dr. Albrecht MAURER, Dr. Roman KOCH, Ultrasonic Testing Machines with Robot Mechanics – A New Approach to CFRP Component Testing, 2nd International Symposium on NDT in Aerospace 2010 - Mo.4.A.3
- Ultrasonic Nondestructive Testing – Advanced concepts and applications, zone.ni.com/devzone/cda/tut/p/id/5369

Index Terms

Computer Science  
Signal Processing
**Key words**

<table>
<thead>
<tr>
<th>Pulse-echo technique</th>
<th>Immersion Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion frame</td>
<td></td>
</tr>
</tbody>
</table>