Influence of couplant thickness and impurities within the flaws on ultrasonic echo amplitude in Non Destructive Testing of metals

T M R Tennakoon[1*] and N Munasinghe[2]

[1] *Atomic Energy Authority, 60/460, Baseline Road, Orugodawatta, Wellampitiya*

[2] *Department of Materials Engineering, Faculty of Engineering, University of Moratuwa, Katubedda*

In Ultrasonic Testing of materials a high frequency signal is sent by a probe to the material and the signal is propagated through the test piece. In the presence of any discontinuity or defect (flaw) in the wave propagation area the signal will be reflected and can be received back by the same probe. By the placement of this echo signal on time axis it can be observed that the reflecting echo is mainly influenced by size, orientation, and the distance between probe and the flaw. Additionally the thickness of the couplant, a thick liquid or grease, which is applied between probe and test piece to reduce the acoustic impedance mismatch between probe and the work piece, can affect the echo amplitude. The impurities in the flaw can also influence the above measurement.

The objective of this work was to investigate how these factors influence the echo amplitude and to find out methods to eliminate such effects from amplitude value, which will enhance the ability to interpret the flaw type by using the variation of echo amplitude.

In this work different couplant thickness values were used to measure the change in echo amplitude using a mild steel test block (IIW-VII standard test block) as the work piece.

From the observations it can be concluded that the echo amplitudes reduce remarkably whenever the thickness of couplant equals half the wavelength of ultrasound or any multiple of it. The reason for this is a condition of resonance exists whenever the thickness of couplant equals half the wavelength of ultrasound or any multiple of it. At this condition pulse amplitude increases. Therefore, the maximum energy will transmit into the test piece and hence echo amplitude gives maximum value. As such, if the echo amplitude is to be considered for interpretation of defects it is very important to maintain a constant couplant thickness (optimum value –1 mm) during the entire ultrasonic test.

For the detection of the influence of impurities within the flaw on echo amplitude, artificial flat bottom holes having different diameters filled with welding slag were used. According to the observations, it can be concluded that welding slag within the defect does not seriously affect the flaw echo amplitude and this factor can be neglected in evaluation of defects using echo amplitude.

* srlaea@slt.lk Tel: 011 2533427/8