

# *Ultrasonic Testing Classroom Training Book*

## Text Corrections

The following text corrections apply to the first and second printing of the *Ultrasonic Testing Classroom Training Book*. The third printing of this publication has incorporated the corrections into the published text.

**Page 12, par. 4:** Delete second sentence: ~~They propagate on the surface of the material at a velocity about 2% less than shear waves.~~ Replace with the following: They travel at a velocity of 117 200 in. (297 688 cm) per second in steel compared to the shear wave velocity of 128 000 in. (325 120 cm) per second. Thus, Rayleigh waves travel in steel at 91.6% the velocity of shear waves, or 8.4% less.

**Page 14, Figure 2.7:** The left-hand figure should be labeled “Asymmetrical”; the figure on the right should be labeled “Symmetrical.”

**Page 16, par. 4 under “Impedance Ratio”:** Delete third sentence: ~~The impedance ratio for a liquid-to-metal interface is about 20:1 (about 90% reflection), whereas the impedance ratio for air-to-metal is about 100 000:1 (virtually 100% reflection).~~ Replace with the following: Whereas the impedance ratio for air-to-metal is about 115 000:1 (virtually 100% reflection), the impedance ratio for a liquid-to-metal interface is lower. For example, the acoustic impedance values of water and steel are 0.148 and 4.616, respectively, making the impedance ratio about 31:1. Reflection may be calculated by using the following formula:

$$R = \frac{(Z_2 - Z_1)^2}{(Z_2 + Z_1)^2}$$

where  $Z_1$  is the impedance value of the first material and  $Z_2$  that of the second. Inserting the above values, a value of 88% reflection at the water-to-steel interface is obtained:

$$R = \frac{(4.616 - 0.148)^2}{(4.616 + 0.148)^2} = \frac{4.468^2}{4.764^2} = \frac{19.963}{22.696} = 0.88$$

**Page 46, par. 1, under “Transducer Materials”:** The second through fourth sentences should read as follows: The three most common piezoelectric materials used in ultrasonic transducers from the 1930s through the early 1980s were quartz, polarized ceramic, barium titanate and lithium sulfate. Barium titanate ~~is~~ was regarded as the best material to use as a transmitting crystal, while lithium sulfate ~~is~~ was widely thought to be the best material for receiving ultrasonic vibrations. Today, the most common ~~ceramics~~ crystalline components of the ceramic transducer elements are barium titanate, lead metaniobate and lead zirconate titanate.

**Page 63, par. 2 under “Contact Testing”:** Change first sentence as follows: Contact testing is divided into ~~three~~ four techniques that are determined by the sound beam wave mode: (1) transmitting longitudinal waves in the test object; (2) generating shear waves; ~~and (3) the surface wave technique for producing Rayleigh or Lamb waves producing~~ Rayleigh (or surface) waves; and (4) producing Lamb (or plate) waves.

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