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Electromagnetic modulation of the ultrasonic signal for nondestructive detection of small defects and ferromagnetic inclusions in thin wall structures PETER FINKEL, Drexel University — We report on new non-destructive evaluation technique based on electromagnetic modulation of ultrasonic signal for detection of the small crack, flaws and inclusions in thin-walled parts. The electromagnetically induced high density current pulse produces stresses which alter the ultrasonic waves scanning the part with the defect and modulate ultrasonic signal. The excited electromagnetic field can produce crack-opening due to Lorentz forces that increase the ultrasonic reflection. The Joule heating associated with the high density current, and consequent thermal stresses may cause both crack-closure, as well as crack-opening, depending on various factors. Experimental data is presented here for the case of a small crack near holes in thin-walled structures. The measurements were taken at 2-10 MHz with a Lamb wave wedge transducer. It is shown that electromagnetic transient modulation of the ultrasonic echo pulse toneburst suggest that this method could be used to enhance detection of small cracks and ferromagnetic inclusions in thin walled metallic structures.

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