

Abstract Submitted
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Electromagnetic stimulation of the ultrasonic signal for nondestructive detection of the ferromagnetic inclusions and flaws PETER FINKEL, Drexel University — It was recently shown that thermal or optical stimulation can be used to increase sensitivity of the conventional nondestructive ultrasonic detection of the small crack, flaws and inclusions in a ferromagnetic thin-walled parts. We proposed another method based on electromagnetic modulation of the ultrasonic scattered signal from the inclusions or defects. 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 cracks near small 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 tone-burst 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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