Abstract Submitted for the SES16 Meeting of The American Physical Society

Residual stress analysis with Opto-Acoustic Method.<sup>1</sup> FUMIYA MIURA, Southeastern Louisiana University, TOMOHIRO SASAKI, MASARU USUI, Niigata University, SANICHIRO YOSHIDA, Southeastern Louisiana University, SHUICHI SAKAMOTO, Niigata University — A nondestructive method to analyze welding-induced residual stresses is proposed. The proposed method consists of acoustic and optical techniques. The acoustic device (scanning acoustic microscope or contact acoustic probe) is used to measure the acoustic velocity of the specimen. According to acoustoelasticity, compressive/tensile residual stresses increase/decrease acoustic velocity. The optical device (Electronic Speckle-Pattern Interferometer, ESPI) detects acceleration due to a low-level tensile load (approximately a quarter of the yield stress) applied by a test machine. According to the theory of harmonic oscillation, masses have positive/negative acceleration when they move toward/from the equilibrium location. The acoustic and optical measurements have been performed on butt-welded aluminum alloy specimens (20 mm x 50 mm, 5 mm thick) on a point-by-point basis, and the acoustic and optical results are compared with each other. For most specimens, the acoustic and optical measurements appear consistent with each other. Our final goal is to make this method totally nondestructive and quantitative.

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