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Nonlinear ultrasonic parameters to laser weld quality for Small Modular Reactor

Abstract : Nonlinear ultrasonic testing (NUT) technique can be used to identify microscopic material properties over conventional (linear) UT owing to its high sensitivity in which the nonlinear parameters establish a set of signal pattern recognitions such as forming higher harmonic waves. To replace conventional SAW, ESW on cladding, implementation of laser cladding technique has been studied with advanced robotics to minimize machining surface and welding quality. In this study, a set of laser welding process was applied to stainless steel and the signals pattern processing algorithms were determined to identify the weld quality (such as inclusion, crack, incomplete fusion and penetration) by means of nondestructive examination. Experimental correlations between laser weld microstructure and NUT signals were disccused in terms of the manufacturing SMR componenets.

Keywords: Nonlinear ultrasonic, Nondestructive test, Laser welding, Signal processing algorithm

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