Point-Focusing Electromagnetic-Acoustic Transducer for Crack Inspection

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Stress corrosion cracking in stainless-steel pipes is a critical failure in atomic power plants and chemical plants. In ultrasonic testing, piezoelectric transducers are generally used, in which reproducibility of amplitude measurements is not necessarily high because of effects of coupling materials and contacting conditions between the transducers and specimens. Comparing to the transducers, an electromagnetic acoustic transducer (EMAT) requires no coupling materials and is less sensitive to the contacting conditions, making the reproducibility higher. However, lower signal to noise (S/N) ratio has been a disadvantage. For increasing the S/N ratio, we developed a point-focusing EMAT (PF-EMAT) [1]. It generated shear-vertical (SV) waves from concentric line sources on a top surface of a specimen. Coil configuration of the EMAT was designed so that the SV waves were accumulated in phase at a focal point on the bottom surface, which increased the S/N ratio and improved the spatial resolution. We have designed PF-EMATs operated at different frequencies, and applied to artificially fabricated defects on stainless steel specimens. In this presentation, we show the results, and discuss availability of the PF-EMAT to crack inspection.

Acknowledgement:

This work was supported by JSPS KAKENHI Grant Number 15K13834.

References: