

Development of Eddy Current Testing System for Welding Inspection

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ABSTRACT:

Non-Destructive Test (NDT) techniques are widely used in several industries since nowadays most of the modern structure are made from steel structures. NDT relates to the examination of materials for flaws without harming the object tested. Eddy Current Testing (ECT) technique is a non-destructive testing method, which is used to detect discontinuities and defects in conductive material. This paper presents a system development with a scanning mechanism for determination of weld defect by using ECT technique. Owing to the low noise of the Anisotropy Magneto resistive (AMR) sensor, the ECT system with the AMR sensor has an advantage of detecting deep and small defects in metal structures. In this study, we developed a magnetic probe using AMR sensor with a sensitivity of $1 \text{ nT}/\sqrt{\text{Hz}}$ that is capable to detect inner defects even at a low frequency. The performances based on characterization of Metal Inert Gas (MIG) welding traces on carbon steel plates. The metal plate is scanned using the XY stage and the detected magnetic signal is utilized to construct 2D image of magnetic distribution map. To improve the sensitivity and operation of the AMR sensor, a small cancellation coil around the AMR sensor is fabricated to cancel the applied magnetic field coupled directly to the sensor. Moreover, the effect of the liftoff between the metal plate and the AMR sensor is studied while the liftoff is lowered from 20 to 4 mm. The results show that a small liftoff could improve the resolution of the constructed distribution map, hence enabling the identification of metal plates and their weld beads. Using the developed ECT systems, the small defects in the samples was successfully detected.

Keywords - *Non-Destructive Test, Eddy current, Anisotropic Magneto-Resistive*