List of Dissertation Abstract (Department of Artificial Environment)

Name	Supervisor	Title	Abstract
TRUNG LE QUANG	KASAI Naoya	Development of Eddy Current Probes Based on Various Core Shapes and Materials	This study investigates the development of an innovative probe for eddy current (EC) testing, which differs from traditional probes that use ferrite cores. The new probe features a copper core with slits and a conical shape, enhancing EC convergence at the tip to improve induction effects on test specimens. A single circular detection coil allows for crack detection on aluminum plates, showcasing strong performance. However, the probe's sensitivity to lift-off distance impacts the signal-to-noise ratio (S/N). To address this, two approaches were employed: a differential signal method using two coils and a new probe design with two copper cores and a unidirectional EC (UEC) component. Another challenge was the weakening of crack signals parallel to the EC lines. To overcome this, a rotating uniform eddy current convergence (RUECC) probe was developed to create a rotating EC on the specimen's surface, enhancing crack detection in all orientations. Finite element method (FEM) simulations and experiments validated the effectiveness of these probes. Additionally, a RUEC probe was introduced for detecting artificial cracks in conductive materials, featuring four rectangular coils and ferrite cores. Finite element simulations and experiments confirmed its ability to detect cracks in all directions. A square-film EC probe for surface crack detection on aluminum was also developed, with interleaved coils and iron-based ferromagnetic amorphous alloy particles to amplify magnetic flux density. FEM simulations and experiments demonstrated improved crack detection capabilities. The study also explored three EC probe configurations with different coil orientations, assessing EC generation efficiency and crack signal magnitude. Overall, this research contributes to advancing EC probe development and crack detection capabilities.