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Application of neural networks to the identification of artificial defects using sweep-frequency eddy current testing

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The article discusses the practical application of the inverse method of electromagnetic non-destructive investigation of austenitic materials. It includes the design of a robust tool for the automated localization of material defects. To identify and evaluate deep artificial defects, the sweep-frequency eddy current method with harmonic excitation is used. The objects of interest are surface electric-discharged machined notches with a defined geometry fabricated in a plate with a thickness of 30 mm. By using the designed probe combined with the frequency sweeping of eddy currents, it is possible to reliably detect artificial defects up to 24 ± 0.5 mm deep by using low-frequency excitation signals. An important fact is that the measuring probe does not have to be placed directly above the examined defect. The achieved experimental results are processed and evaluated. For this purpose, we designed and tested a simple neural network whose task is to identify defects in the material's structure and indicate the probable occurrence of defects. The network is designed to be able to locate not only visible defects but also those located inside the material.

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