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港湾鋼材に対する渦電流探傷法の高精度化の研究
Improvement of eddy current testing method for sheet piles on harbor

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The applicability and the feasibility of eddy-current testing method for the detection of wall thinning and surface crack of steel structure have been practically confirmed by field and laboratory experiments. Qualitative analysis of cracks has been empirically understood by analog analysis. There has, however, been a growing demand to quantitatively evaluate the cracks. We tackle this problem by use of time series of induced magnetic field by the cracks.

In the present study, we proposed a new digital analysis process to use the induced magnetic field waveform, and validated the effectiveness of the method using numerical simulations. First, we developed a high-speed electromagnetic simulator using a fictitious wave domain method to reproduce the conventional eddy current testing method for realistic sheet-piles seawater model. Then, we confirmed the features of the induced magnetic field waveforms by many types of cracks.

Paying attention to the residuals of the induced magnetic field waveform, we developed a novel migration procedure that has not been used up to now in electromagnetic field. Using this, we could get crack imaging without phase lag. For the evaluation of the crack position and wall thinning of the sheet piles, we also applied attribute analysis used in the field of seismic survey.

Through the application of the digital signal processing using induced magnetic field waveform, we could be successful with developing a high degree of accuracy of the eddy current testing method.

キーワード: 非破壊検査, 渦電流探傷法, 仮想領域法, マイグレーション処理, アトリビュート解析, 電磁気
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