

Visualization of Corrosion at Plate-Like Structures Based on Ultrasonic Wave Propagation Images

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Abstract : A non-contact nondestructive technique using laser-induced ultrasonic wave generation method was applied to visualize corrosion damage at aluminum alloy plate structures. The ultrasonic waves were generated by a Nd:YAG pulse laser, and a galvanometer-based laser scanner was used to scan specific area at a target structure. At the same time, wave responses were measured at a piezoelectric sensor which was attached on the target structure. The visualization of structural damage was achieved by calculating logarithmic values of root mean square (RMS). Damage-sensitive feature was defined as the scattering characteristics of the waves that encounter corrosion damage. The corroded damage was artificially formed by hydrochloric acid. To observe the effect of the location where the corrosion was formed, the both sides of the plate were scanned with same scanning area. Also, the effect on the depth of the corrosion was considered as well as the effect on the size of the corrosion. The results indicated that the damages were successfully visualized for almost cases, whether the damages were formed at the front or back side. However, the damage could not be clearly detected because the depth of the corrosion was shallow. In the future works, it needs to develop signal processing algorithm to more clearly visualize the damage by improving signal-to-noise ratio.

Keywords : non-destructive testing, corrosion, pulsed laser scanning, ultrasonic waves, plate structure

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