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Stochastic modeling of pitting corrosion and tensile tests with artificially pitted members

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Summary: Pitting corrosion is a great concern when the integrity of ship's hull structures is considered. Corrosion pits with a conical shape are typically observed on coated hold frames in way of cargo holds of bulk carriers which exclusively carry coal and iron ore. A series of tensile tests using specimens with randomly distributed pits has been conducted to investigate their effect on tensile strength. The stochastic model developed in the previous study has been employed to determine the random pit distribution for the tensile test specimens. It has been shown that tensile strength is little affected by the pitting pattern and total elongation is influenced by the pitting pattern in cases where the degree of pitting intensity (DOP) is the same. Following the experiment, the empirical formula, where DOP and pit diameter D are used to estimate the tensile strength of pitted steel plates, has been applied to the test results. It has been revealed that the tensile strength of randomly pitted steel plates could be predicted conservatively by replacing D with $0.8D_{max}$ (D_{max}: diameter of largest pit) in the formula.

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