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Non-destructive Evaluation of Coating Degradation and Rust Creep

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Organic coatings are widely applied for the protection of metal structures from corrosion. The current methods for coating performance assessment rely on either subjective evaluation and comparison between photo references or destructive evaluation of test panels. Rust creep is established as one important indicator, as detailed in the ISO12944 and may act as a passing criterion of prequalification for coatings. However, the rust creep assessment according to ISO12944 is by nature destructive, and consequently the samples cannot re-enter into further testing cycles. Non-destructive methods allow for the evaluation of coating performance in a more efficient and cost-effective way where the same coated panel can be tested over time and the early corrosion advancement can be detected and monitored progressively. This allows not only the resources (man-hour and number of test samples) applied for the coating performance evaluation to be minimised, but also for a better understanding of the rust creep propagation/coating degradation mechanism. In the present work, two non-destructive techniques – optical 3D Profilometry and Scanning Acoustic Microscopy (SAM) are applied to assess the rust creep from an artificially scribe line introduced in a coated panel. Assessment results from these two techniques are then compared with the ones obtained by the most commonly used destructive rust creep testing method based on ISO 12944-9. The comparison results show that the optical 3D Profilometry and SAM can act as the non-destructive test methods providing more efficient rust creep evaluation.