

Crevice Corrosion Behavior of Rail Steel Grade U900A by Corrosion Monitoring Sensor and Coupons at Lampang Environment

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The contact between the railway track and fastening systems often contains crevices at the interface. These areas are highly susceptible to severe and unpredictable crevice corrosion, posing significant challenges to long-term durability and maintenance. This project studied crevice corrosion behavior by rail steel grade U900A via crevice sensor and coupons. In the development of a laboratory-scale prototype of a bi-electrode sensor for crevice corrosion, the experimental results indicated that the corrosion data obtained from the crevice sensors showed good agreement with those from coupons under similar simulated conditions. Therefore, corrosion monitoring sensor can enhance the accuracy of corrosion prediction, as they enable detailed measurement of corrosion progression through electrochemical techniques.

Accelerated cyclic corrosion tests with exposure to synthetic ocean water salt-deposition process (ISO 16539) were simulated in accordance with the exposure test condition at Lampang station for 12 months. The corrosion rates were found to be consistent with each other. The corrosion classification (ISO 9223) was determined to be category C2. Under simulated condition at more severe corrosivity, the corrosion rate increased by 1 – 2 categories.

Corrosion map for rail steel and fastening system has been constructed based on crevice corrosion studies in accelerated corrosion tests and field test validation. The resulting data will support the selection of rail materials appropriate for specific environmental conditions, facilitate informed decision-making regarding rail infrastructure expansion, and contribute to the development of a corrosion map for rail materials across various regions of Thailand. The key finding can be applied to crevice corrosion in other industries as well.

Graphical Abstract (mandatory)

