Design of mobile electrode matrix for Potential Matrix Mapping

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Abstract: Potential Matrix Mapping (PMM, also known as Field Signature Method) method is a highly accurate and sensitive non-intrusive corrosion monitoring method, which has been successfully applied in submarine pipelines, oil refineries, bridge monitoring and other fields. However, due to the limitation of the weld-type electrode matrix, a set of PMM equipment can only monitor a fixed part. By separating the PMM corrosion detection equipment from the fixed position, the application field of PMM can be expanded, and the PMM can be developed from the corrosion monitoring method to the corrosion detection method. In this paper, two kinds of mobile electrode matrix schemes of assembled type and glue-packed type are designed and made for the typical application scenarios of flat plate and pipeline. Each electrode matrix scheme includes magnetic electrode structure, electrode limit structure and electrode matrix positioning structure. The assembled mobile electrode matrix and the glue-packed mobile electrode matrix were laid on the flat plate and pipeline for voltage signal reproducibility test to simulate the process of PMM corrosion detection. The test results show that the signal reproducibility of the glue-packed mobile electrode matrix is better than that of the assembled mobile electrode matrix. The reproducibility relative error of all channels is less than 5%, and the reproducibility relative error of most channels is less than 2%, which can meet the signal acquisition requirements of PMM corrosion detection. Finally, the mobile electrode layout and testing scheme of PMM corrosion detection are established, which have a certain guiding role for the standardization and standardization of mobile electrode layout of PMM detection methods.

Keywords: Potential Matrix Mapping; Magnetic electrode; Limit structure; Positioning structure; Electrode matrix

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