Dynamic characterization for soil/environmental conditions in coating/substrate metal interface systems by stochastic modeling

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In this study, influences of soil properties on corrosion behavior of buried pipelines in Coating/CP systems are simulated in laboratory conditions through different soil types using Electrochemical Impedance Spectroscopy (EIS). Soil detection and analysis methods, such as determining soil resistivity, and pH are used to detect the changes of soil parameters with time. The outcome of the analysis includes the correlation of coating/substrate interfacial mechanisms vs. physical properties existing in laboratory prototypes by developing functional relationships.

Second part of this study focuses on estimating environmental corrosivity in terms of metal degradation rate in specific soil conditions based on field data along with soil condition and estimated environmental properties (temperature and moisture) via data mining. Due to the limitation of the field data, soil conditions were clustered into similar groups to reduce the variability of the data within the similar environment while the variability between dissimilar environments was maximized. After clustering the field data, the probability density of corrosion rate within each region is estimated based on the lab data to assess the reliability of the field data conditions.