

Underground Corrosion Model of Steel Pipelines Using In Situ Parameters of Soil

Siti Nor Fariza Mior Mohd Tahir¹, Nordin Yahaya¹, Norhazilan Md Noor¹, Lim Kar Sing² and Azlan Abdul Rahman¹

¹Faculty of Civil Engineering, Universiti Teknologi Malaysia, UTM Skudai, Johor 81310, Malaysia

²Faculty of Civil Engineering and Earth Resources, Universiti Malaysia Pahang, Lebuhraya Tun Razak, Gambang, Kuantan, Pahang 26300, Malaysia

ABSTRACT

A simple yet practical model to estimate the time dependence of metal loss (ML) in underground pipelines has been developed considering the in situ soil parameters. These parameters are soil resistivity, pH, moisture content, chloride content, and salinity. The time dependence of the ML was modeled as $P_{\max} = kt^n$, where t is the time exposure, k is ML constant, and n is the corrosion growth pattern. The results of ML and in situ parameters were analyzed using statistical methods such as data screening, linear correlation analysis, principal component analysis, and multiple linear regressions. The best model revealed that k is principally influenced by resistivity, and n appears to be correlated with chloride content. Model optimization was carried out by introducing several observation criteria, namely, water access, soil color, and soil texture. The addition of these factors has improved the initial accuracy of model to an R^2 score of 0.960. As a conclusion, the developed model can provide immediate assessment of corrosion growth experienced by underground structures.

KEYWORDS: Underground pipeline, Corrosion model, in situ parameters, Soil

DOI: [10.1115/1.4028424](https://doi.org/10.1115/1.4028424)