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Modeling of External Metal Loss for Corroded Buried Pipeline

A statistical predictive model to estimate the time dependence of metal loss (ML) for buried pipelines has been developed considering the physical and chemical properties of soil. The parameters for this model include pH, chloride content, caliphate content (SO), sulfide content, organic content (ORG), resistivity (RE), moisture content (WC), clay content (CC), plasticity index (PI), and particle size distribution. The power law-based time dependence of the ML was modeled as $P = kt^v$*, where t is the time exposure, k is the metal loss coefficient, and v is the corrosion growth pattern. The results were analyzed using statistical methods such as exploratory data analysis (EDA), single linear regression (SLR), principal component analysis (PCA), and multiple linear regression (MLR). The model revealed that chloride (CL), resistivity (RE), organic content (ORG), moisture content (WC), and pH were the most influential variables on k, while caliphate content (SO), plasticity index (PI), and clay content (CC) appear to be influential toward v. The predictive corrosion model based on data from a real site has yielded a reasonable prediction of metal mass loss, with an* R^2 *score of 0.89. This research has introduced innovative ways to model the corrosion growth for an underground pipeline environment using measured metal loss from multiple pipeline installation sites. The model enables predictions of potential metal mass loss and hence the level of soil corrosivity for Malaysia.*
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