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Assessment of Corrosion on Buried Metallic Pipeline Induced by AC Interference Below High Transmission Line

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Abstract

High voltage alternating current (HVAC) transmission line is usually shared the same right of way with buried metallic pipeline . Long-term exposure of inductive coupling on buried metallic pipeline will cause AC corrosion at any coating defects on the pipeline . In the West Coast of Malay Peninsula, the AC-induced corrosion is not well studied, and the preventive maintenance is not taken into consideration by some of the pipeline operators. The objective of this paper is to assess AC corrosion susceptibility of the buried metallic multiproduct pipeline (MPP), which is cross or parallel to the HVAC along West Coast of Malay Peninsula. This MPP is laid from Sg. Udang, Melaka to distribution terminal in Dengkil, Selangor with approximate distance of 130km. It was identified that along the pipeline routing, only 16 locations of MPP sections are cross and parallel to the HVAC. Standard industrial practice and equipment were used to conduct this corrosion assessment . Cathodic protection (CP) potential and AC output are measured using multimeter, clampmeter and $Cu/CuSO_4$ reference electrode. While soil resistivity is determined by using soil resistivity meter with the native soil sample at site. Magnetic field magnitude is determined by using Biot-Savart Law formula. The current density is calculated for each MPP sections, and the pipeline sections that are in the risk of AC corrosion are determined. On the other hand, the CP system affected by stray current are further analyzed. Three locations indexed as (TP 43, TP 102 and TP105) are found under risk of AC corrosion , which is in the range of 20–100 A/m^2. As per standard industry practice such as NACE SP-0169 and PTS 30.10.73.10, AC corrosion is unpredictable for AC current density in between above-stated range. These three locations have the highest AC voltage output, the lowest soil resistivity value and the CP potential measured are under protected value. However, the effect of magnitude of magnetic field has no compelling correlation on the AC corrosion activity. In conclusion, AC voltage, soil resistivity and CP potential at the crossing and parallel section to the HVAC play a significant role to the behavior and severity of the AC corrosion on the metallic buried pipeline .

Author keywords

AC corrosion ; AC interference ; Cathodic protection; Current density; Soil resistivity

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