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Method for diagnosis of the effect of AC on the X70 pipeline due to an inductive coupling caused by HVPL

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Abstract: The inductive coupling between high-voltage power lines (HVPL) and buried pipelines has been an important research subject over the last decades. This coupling may result in alternating current (AC) on pipelines that may pose a serious threat to the pipelines due to corrosive effects and the cathodic protection (CP) performance. A method to investigate the effects of the induced AC density on the corrosion and the CP performances of the X70 steel buried pipeline due to the inductive interference caused by HVPL is proposed in this study. The method is based on the corrosion parameters of the X70 steel pipeline obtained by electrochemical measurements such as Tafel slopes, corrosion current densities, and corrosion potentials. These parameters were used as boundary conditions in the elaborated CP model. The results showed that, firstly, the induced AC density affects the electrochemical characteristic of the X70 steel and accelerates the corrosion of the pipeline. On the other hand, the impressed current cathodic protection is incapable of maintaining the CP potential level. However, some technical solutions were proposed to prevent the pipelines from AC corrosion and maintain the CP potential to an acceptable level.

Keywords : electrochemical analysis, interference, chemical variables measurement, power cables, steel, electric current measurement, Corrosion protection, pipelines