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Corrosive effects of the electromagnetic induction caused by the high voltage power lines on buried X70 steel pipelines

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Abstract: This paper diagnoses the corrosive effects of the electromagnetic induction caused by double circuit high voltage power lines (HVPL) on the buried X70 steel pipelines. To achieve this objective, firstly the electromagnetic interference between the double circuit HVPL and the X70 steel pipeline (the distribution of the magnetic field and the induced AC current densities in the buried X70 steel pipeline) and the factors affecting this interference such as the vertical distance between the double circuit HVPL and the X70 steel pipeline, and the conductor phase sequence orientation were studied. Then, electrochemical measurements were used to characterize the corrosion polarization properties of X70 steel in simulated soil at various AC current densities. The results show that with an increase in the AC current density, the corrosion rate of the X70 steel increased, indicating that the induced AC current density has accelerated the corrosion degree of X70 steel, by comparison with that in the absence of the AC current density. We can conclude from these results that the electromagnetic induction caused by the double circuit high voltage power lines affects the electrochemical characteristic of the X70 steel pipeline and accelerates the corrosion of the pipeline.

Keywords : Electromagnetic induction, high voltage power line, induced AC current density, X70 steel pipeline, corrosion, Finite element method.