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A review of the effect of AC/DC interference on corrosion and cathodic protection potentials of pipelines

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Abstract

Pipelines installed in the energy utility corridor with alternating current (AC) or direct current (DC) sources have attendant problem of induced corrosion. In the past years, AC or DC induced corrosion of metallic pipelines has been a major challenge facing pipeline utilities. Nevertheless, considerable research studies have been conducted to appraise the impact of both corrosion types on metallic pipelines. While the mechanism of DC induced corrosion is well established with a level of accuracy, the corrosion due to AC has not been fully covered in the literature. This paper presents a comprehensive review of the research trends in this domain with much emphasis on the corrosion caused by AC. Some of the technical and laboratory research works conducted are also covered. A vision for future research is also identified which may be useful for further studies. The series of investigations conducted revealed that the corrosion of pipelines with a coating defect becomes significant as the AC density increases. In extreme cases, corrosion damage is expected if the AC density increases beyond a certain limit. Furthermore, the proposed cathodic protection potential for protecting pipelines against corrosion is not efficient enough when the pipe is exposed to interference caused by AC. Consequently, research studies and field implementations focusing on the combined effect of AC and DC on pipelines with multi-layer soil analysis would give promote understanding of the problem.