Research on Real-time Prediction Method of Corrosion Rate under Dynamic Stray Current Interference

Xin Yu[1*], Haitao Yu[1], Xiaolong Wang[1], Yongping Zhao[1], Jialin Mao[2]

[1]Author's affiliation and full address: CNOOC Corrosion Protection Center for Oil and Gas Fields in CNOOC Energy Development Equipment Technology Co., Ltd, No. 872 of Ninghai Road, Binhai, Tianjin 300450, China.

[2]Author's affiliation and full address: CNOOC Raiborn (Tianjin) Technology Co., Ltd, Tianjin, 300450, China.

Presenter's e-mail address: yuxin11@cnooc.com.cn

Abstract The landing section of submarine pipelines is prone to mixed interference from stray currents, exacerbating corrosion issues. The corrosion behavior and prediction methods for corrosion rates under severe pipe-to-soil potential fluctuations remain areas of study. This paper introduces a novel real-time calculation method for interference corrosion rates grounded in the principle of equivalent circuit response under overpotential driving. By analyzing the corrosion kinetics process, it is evident that pipe-to-soil potential fluctuations induce significant non-Faradaic effects, and the characteristics of these fluctuations substantially impact the proportion of non-Faradaic processes, influencing corrosion rates. This calculation method effectively isolates the influence of non-Faradaic processes on corrosion rates, achieving a prediction accuracy exceeding 85%. Furthermore, this approach calculates corrosion rates based on corrosion current, mitigating the influence of objective factors like corrosion factors and environmental temperature and enhancing its applicability. The relevant achievements are of great significance for the comprehensive perception of corrosion.

Keywords Stray current, Interference corrosion, Non-Fradic effect, Corrosion rate prediction

Reference

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