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## Effect of Cathodic Protection Potential Fluctuations on Pitting Corrosion of X100 Pipeline Steel in Acidic Soil Environment

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### Highlights

- 1. Pitting under cathodic protection potential fluctuations is quantitatively studied.
- 2. Impulse current is derived by the current equation in the time domain.
- 3. Potential on double layer is derived by potential equation in the frequency domain.
- 4. Conclusions of theoretical calculation coincide with pitting density of experiments.

### Abstract

The effect of frequency and time of cathodic protection potential fluctuations on pitting corrosion of X100 pipeline steel was investigated by square wave polarization (SWP) and theoretical calculations. Results demonstrate that pitting corrosion can occur on the cathodically polarized steel and primarily produce on the steel matrix rather than non-metallic inclusions. The pit density increases with the total loading time of the SWP potential ( $t_t$ ) under identical SWP period ( $T$ ). With the extended  $T$ , the density of pits decreases under the same  $t_t$ . The current and potential equations in the time and frequency domains are derived from calculation.

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