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Synergistic Erosion–Corrosion Behavior of Petroleum Pipelines at Various Conditions

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Abstract : The effects of flow velocity, sand concentration, sand size and temperature on erosion-corrosion of petroleum pipelines (carbon steel) in the oil sands slurry were studied by electrochemical polarization measurements. It was found that the anodic excursion spans of carbon steel in the oil sands slurry are characterized by the occurrence of a well-defined anodic peak, followed by a passive region. The data reveal that increasing flow velocity, sand concentration and temperature enhances the anodic peak current density (jAP) and shifts pitting potential (Epit) towards more negative values. The variation of sand particle size does not have apparent effect on polarization behavior of carbon steel. The ratios of the erosion rate to corrosion rate (E/C) were calculated and discussed. The ratio of erosion to corrosion rates E/C increased with increasing the flow velocity, sand concentration, sand size, and temperature indicating that an increasing slurry flow velocity, sand concentration, sand size and temperature resulted in an enhancement of the erosion effect.

Keywords : erosion-corrosion, oil sands slurry, polarization, steel
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