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Electrochemical Techniques for Hydrocarbon Leak Detection in Cooling Water Systems

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Open recirculating cooling water systems are commonly used in petroleum industries, mainly in oil refineries. Heat exchangers are often applied to cool or condense process fluids. The chemical treatment used in cooling water system is essential to prevent corrosion, scaling, fouling and microbiological growth. When tubes fail due to corrosion, the cooling water can be contaminated with hydrocarbons. This contamination may cause corrosion, fouling and microbiological growth. The main purpose of this study is to evaluate electrochemical techniques for quick detection of hydrocarbon leaks in cooling water systems. To this purpose, synthetic cooling water with and without inhibitors, dispersant and biocide was prepared, based on the historical parameters of a refinery cooling water system. Diesel was injected in order to simulate hydrocarbon leak. The electrochemical tests were carried out on carbon steel and brass electrodes that are materials commonly used in heat exchangers of cooling water systems. The results showed that electrochemical impedance spectroscopy and linear polarization resistance tests carried out on brass electrodes were able to detect diesel leak in synthetic cooling water.

Keywords: cooling water, hydrocarbon, diesel, leak, electrochemical techniques

FULL TEXT