Title: ASSESSMENT OF MICROBIAL INFLUENCED CORROSION POTENTIAL IN CARBON STEEL API 5L X60

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Abstract:

Oil production and extraction involve large amounts of water, and due to the growing demand from the Oil & Gas industry, it becomes the main residue of these activities. For this reason, the process of separating water from oil is crucial. Oil is a product of great economic interest and when mixed with water, it causes many problems in the operating facilities. The chemical composition of the produced water is quite complex. It may contain high concentrations of salts, such as carbonates, oxides, hydroxides and sulfate and a variety of microorganisms. The oil transportation is performed by a fleet of oil tanker ships, which are discharged into piers and stored in tanks to supply the refineries. However, these systems are subjected to corrosive processes due to the factors previously described. Therefore, the aim of this research was to evaluate the effect of microorganisms and their metabolites on carbon steel API 5L X60 by studying corrosion caused by the contact with produced water. We built a system for immersion of carbon steel X60 coupons in produced water with dynamic flow. The corrosion potential of the fluid was evaluated by weight loss and biofilm bacteria were quantified by the most probable number technique over a 30 days period. These tests were complemented with microscopy and molecular biology. It was observed that biofilm formation had a similar adherence pattern in all the studied groups, and that bacterial concentration in the biofilm was elevated by the end of the assay. General but not localized corrosion (pitting) was detected on the metal surface. In fact, the studied ecosystem is already prone to corrosion, due to a synergistic effect between chloride ions and the biogenic sulfide. Here we show that, under laboratory conditions, a period of 30 days was not enough for pitting formation on unharmed metal in contact with produced water.

Keywords: microbially induced corrosion; crude oil; produced water; carbon steel; molecular biology; microscopy.

Development Agency: Petrobrás, Cnpq