

Biologically Active Solid Deposits in Biocide treated Oil and Gas pipelines from a Nigerian Onshore Oil Production Facility

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Abstract

Pipelines transporting crude oil, produced water and gas from an onshore oil producing facility in Nigeria are subject to frequent corrosion failures despite treatment programs with chlorine (0.5mg L⁻¹) and sodium azide (0.2 mg L⁻¹). Solid deposit samples from 6 corroded pipelines were analyzed chemically and biologically to determine whether the corrosion episodes were as a result of microbial activity. Microbiological analysis showed relatively high concentrations of microorganisms associated with corrosion such as SRBs (10³-10⁵ cell g⁻¹) and APBs (10³-10⁷ cells g⁻¹) while chemical analysis showed evidence of corrosion products such as iron II, calcium, sulfide, carbonate and bicarbonate. Chemical analysis also revealed that environmental conditions such as availability of nutrients, pH, moisture and redox potential were favorable for the growth and proliferation of these microorganisms. All the pipeline samples that were investigated recorded remarkable corrosion rates that ranged from 0.065-0.30 mm yr⁻¹ but the rates were higher in chloride treated pipelines. Our investigation revealed that the solid deposit samples were biologically active and pipeline corrosion was as a result of microbial activity. Thus the prevalence of bio-corrosion is likely to be higher in cases where routine pipeline cleaning and checks are not strictly adhered to despite regular biocide treatment programs

Keywords: Corrosion, Solid Deposits, Pipelines, Biologically Active

Published In: 2013