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Identification of microorganisms associated with corrosion of offshore oil production systems

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Microbiologically influenced corrosion (MIC) poses a major challenge to oil producers and distributors. The annual cost associated with MIC-related pipeline failures and general maintenance and surveillance of installations amounts to several billion dollar in the oil production sector alone. Hence, large efforts are undertaken by some producers to control and monitor microbial growth in pipelines and other installations, and extensive surveillance programs are carried out in order to detect and quantify potential MIC-promoting microorganisms. Traditionally, efforts to mitigate and survey microbial growth in oil production systems have focused on sulfate-reducing Bacteria (SRB), and microorganisms have usually been enumerated by the culture-dependent MPN (most probable number) -technique. Culture-independent molecular tools yielding much more detailed information about the microbial communities have now been implemented as a reliable tool for routine surveillance of oil production systems in the North Sea. This has resulted in new and hitherto unattainable information regarding the distribution of different microorganisms in hot reservoirs and associated oil production systems. This presentation will provide a review of recent insights regarding thermophilic microbial communities and their implication for steel corrosion in offshore oil production systems. Data collected from solids and biofilms in different corroded pipelines and tubes indicate that in addition to SRB, other groups such as methanogens and sulfate-reducing Archaea (SRA) are also involved in MIC. In the hot parts of the system where the temperature approaches 80 ^{0}C, SRA closely related to Archaeoglobus fulgidus outnumber SRB by several orders of magnitude. Methanogens affiliated with the genus Methanothermococcus were shown to completely dominate the microbial community at the metal surface in a sample of highly corroded piping. Thus, the microbial communities associated with MIC appear to be more complex than previously recognized by the industry.