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Importance of the Multiple Lines of Evidence (MLOE) approach in Diagnosing Microbiologically Influenced Corrosion (MIC)

Clean Biocide Project

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Microbiologically influenced corrosion (MIC) is a problem in the oil and gas industry and many other water sectors. However, improper diagnosis of MIC is common, and the fallout of a misdiagnosis can be expensive. Biocides and pigging could be used when they aren't needed, or MIC is not diagnosed, increasing severity and mitigation costs in the future.

MIC does not have a single defining characteristic. However, in the industry, MIC is sometimes diagnosed based on a few or a single variable. Commonly, the presence of a specific species of sulfate-reducing bacteria (SRB) water or the presence of pitting on coupons [1]. However, MIC can be caused by other microorganisms and doesn't necessarily cause pitting. Conversely, the presence of SRB doesn't necessarily cause MIC on its own, and other mechanisms exist that cause pitting corrosion.

In the laboratory, a biofilm reactor was used to test the efficacy of a halophyte-based biocide against a mixed microbial culture. The biocide was added after 3 weeks, but after one week, the microbial community adapted, and the continuously monitored H_2S increased to pre-biocide-exposure levels. However, no new pitting corrosion occurred after the biocide exposure – was this MIC?

Using 16S rRNA gene sequencing, H_2S concentration, coupon surface topography, and coupon weight loss, this poster presentation highlights the importance of the Multiple Lines of Evidence (MLOE) approach in diagnosing MIC.

[1] A. A. Abilio, J. Wolodko, R. B. Eckert, and T. L. Skovhus, "Review and Gap Analysis of MIC Failure Investigation Methods in Alberta's Oil and Gas Sector," in *Failure analysis of microbiologically influenced corrosion*, 1st ed., R. B. Eckert and T. L. Skovhus, Eds. CRC Press, 2021, pp. 25–66.