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INTEGRATED APPROACH TO MONITORING MICROBIOLOGICAL CORROSION INDUCED BY SULFATE-REDUCING BACTERIA*

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Abstract

Sulfate-reducing bacteria (SRB) contribute to reducing the operational strength of industrial facilities, causing microbiological corrosion. Modern monitoring methods aim to apply rapid techniques for detecting the presence of microbiological corrosion and early inhibition strategies. These approaches also focus on analyzing corrosive bacteria consortia, including SRB species.

The development of molecular testing methods covers areas of biomonitoring to optimize existing methods for monitoring the negative effects of microorganisms on industrial facilities [1]. One example is corrosion caused by a consortium of bacteria, mainly represented by a heterogeneous group of sulfate-reducing bacteria that form biofilms and destroy steel [2]. Current approaches to monitoring include a cycle consisting of sampling, cultivation on the selective Postgate medium, qualitative analysis of iron sulfide formation, and initiation of treatment with bactericides. Recent studies on integrating quantitative polymerase chain reaction (PCR), consortium omics analysis, and quorum sensing of corrosive bacteria are relevant for optimizing on-site monitoring and analyzing microbial diversity for industrial needs [3].

An integral part of this monitoring approach is the subsequent processing of samples, molecular testing for the presence of dominant corrosive microorganisms, partially SRB, assessment of the corrosion level (from critical to moderate and satisfactory) and the selection of a bactericide specific to each strain. As a result, molecular test system have been developed with PCR determination of 6 strains of SRB, including the genera *Desulfovibrio*, *Desulfobulbus*, *Desulfomicrobium*, *Desulfobacter*, *Desulfotomaculum*. The selection of bactericides used in industry was based on open data that provides information about their effectiveness against specific strains.

The final integrated approach involves a combination of quantitative analysis of sulfate-reducing bacteria, selection of a suitable strain-specific bactericide for targeted treatment of industrial facilities, and further assessment of SRB distribution in sample collection sites, seasonality, and resistance development to bactericides.

References

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