CHAPTER 14

SULPHATE REDUCING BACTERIA AND THE OFFSHORE OIL INDUSTRY

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ABSTRACT

Corrosion is an electrochemical process. Microorganisms can influence the onset and development of corrosion either by assisting in the establishment of an electrolytic cell (indirect), or by stimulating the anodic or cathodic reactions (direct).

The presence, or absence of oxygen is a critical element in the mechanism of microbial corrosion. In the absence of oxygen the cathodic reaction involves the sulphate-reducing bacteria.

At the present time there are five separate hypotheses that seek to explain the mechanism of anaerobic microbial corrosion. The common thread running through each of these hypotheses is the central involvement of the metabolic activity of the sulphate-reducing bacteria; in particular the production of sulphide and the oxidation of hydrogen. The reason that there is as yet no clear consensus view as to the mechanism probably relates equally to two factors: anaerobic microbial corrosion is inherently a complex process; experimental analyses have largely been carried out with pure cultures of sulphate-reducing bacteria.

The sulphate-reducing bacteria are found in nature as components of mixed microbial communities, or consortia which often exist as biofilms coating, for example, the surface of a steel pipe or offshore oil platform. The sulphate-reducing bacteria are dependent upon the other species within the consortium to supply their immediate nutrients (predominantly hydrogen and acetate), and to generate within an aerobic environment the anoxic conditions required for their metabolism and growth.