

Microbiologically Influenced Corrosion

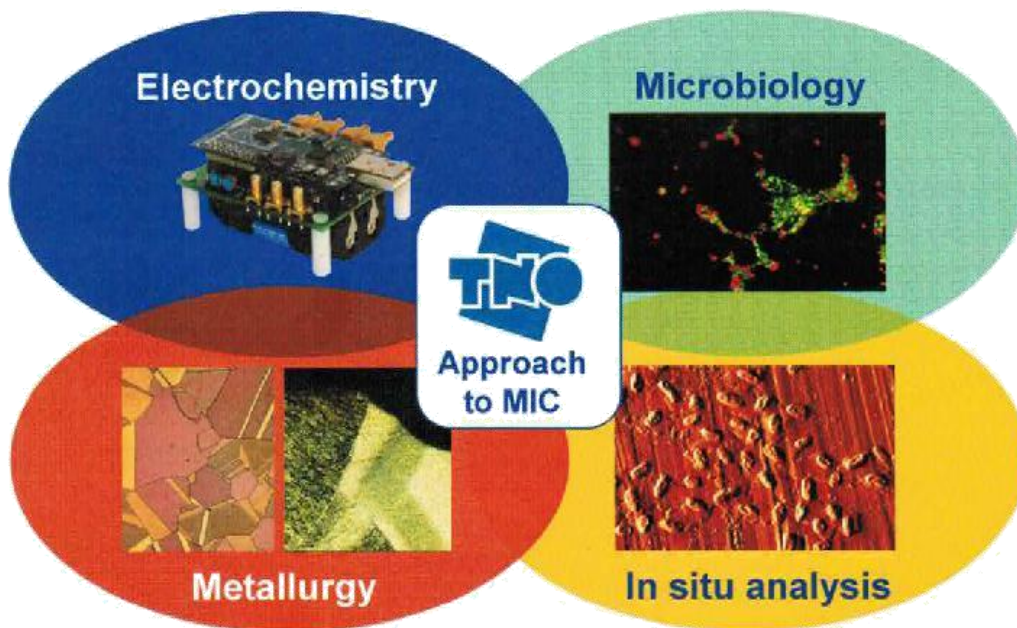


Microbiologically Influenced Corrosion (MIC) is a serious problem in the maritime industry. It has been estimated that as many as 30% of all serious corrosion events are influenced by microbiological activity. In some applications MIC is the most problematical of all corrosion types due to the very rapid, unpredictable and localized nature. MIC is corrosion that is initiated or accelerated (up to 100 x faster) by microorganisms. Unfortunately contamination of systems and surfaces by corrosion causing microorganisms is to a large extent unavoidable. The characteristic localised corrosion caused by MIC can have severe consequences and drastically shorten the life and effective function of maritime structures and installations.

MIC is complex, involving the interaction of biological organisms with chemical and physical processes. Within MIC communities are species that influence corrosion in different ways. These include, amongst others, sulphate reducing bacteria (SRBs), acid producing bacteria (APBs) and iron related bacteria (IB).

The numerous environmental and corrosion contributing factors makes MIC diagnosis very complicated. The characteristic pits are often a clear sign, however this is just part of the puzzle. With expertise in all relevant sciences, TNO covers the whole research field from detection and diagnosis to the development of monitoring, management and prevention techniques.

TNO approach to MIC



Detection and monitoring

MIC is in nearly every case detected too late after damage has occurred. TNO is developing the knowledge that offers the potential for online monitoring of MIC processes and early warning systems. One of these is based upon monitoring and analysing electrochemical data to differentiate between MIC activity and normal corrosion. The other is based upon molecular (DNA) sensing using patented chip technology.

Diagnosis

Misdiagnosis of MIC is not acceptable. TNO has the combined metallurgical, microbiological and corrosion knowledge to ensure reliable diagnosis in any environment. We aim in the future to develop improved protocols to ensure accurate and fast diagnosis for specific problems.

Mitigation

Currently used techniques include mechanical cleaning, cathodic protection and biocide treatment. In many situations these are totally ineffective and in the case of biocides in crude oil pipelines the environmental impact is unacceptable. TNO is looking to optimise treatments for specific applications and is working with industry to achieve this.

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