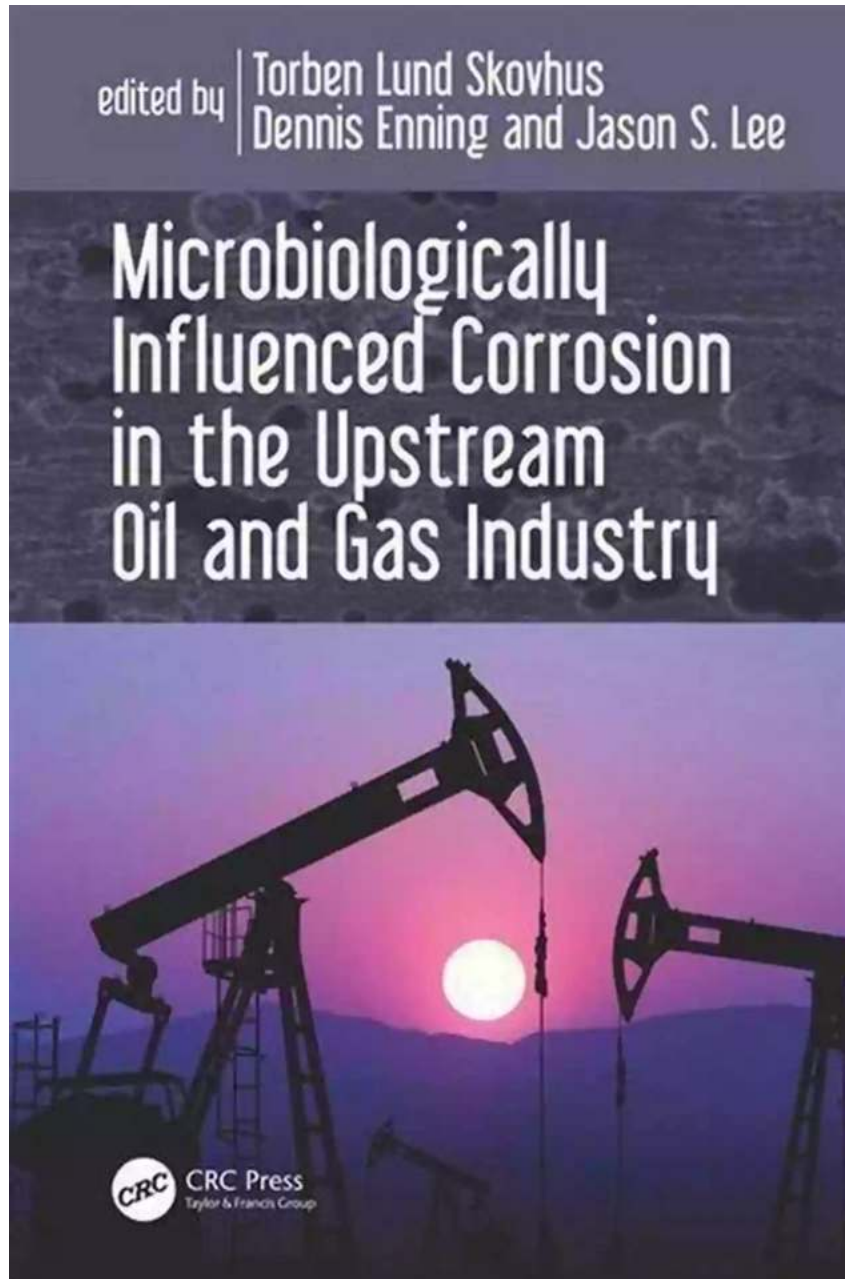


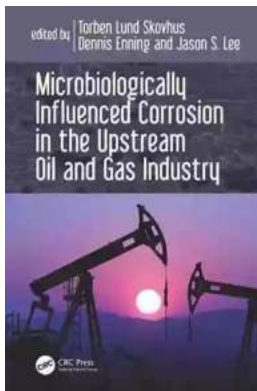
Microbiologically Influenced Corrosion In The Upstream Oil And Gas Industry



In the upstream oil and gas industry, several factors contribute to the deterioration of infrastructure and equipment. One particular challenge that industry players face is microbiologically influenced corrosion (MIC). MIC refers to the process in

which microorganisms, such as bacteria and archaea, interact with the metal surfaces, resulting in accelerated corrosion rates.

MIC can lead to severe economic implications, such as increased maintenance costs, unplanned downtime, equipment failure, and even environmental hazards. It is essential for all stakeholders in the industry to understand the nature of MIC, its causes, and effective preventive measures to mitigate its impact.



Microbiologically Influenced Corrosion in the Upstream Oil and Gas Industry

by J. Paul Guyer(1st Edition, Kindle Edition)

★★★★☆ 4 out of 5

Language : English

File size : 65534 KB

Screen Reader : Supported

Print length : 558 pages



Understanding MIC

MIC occurs when microorganisms form biofilms on metal surfaces, creating an environment conducive to chemical reactions that promote corrosion. These biofilms act as a protective layer, allowing microorganisms to thrive and interact with metal substrates.

A variety of microorganisms, including sulfate-reducing bacteria (SRB), acid-producing bacteria (APB), and methanogenic archaea, contribute to MIC. SRB produce hydrogen sulfide (H₂S), which is a highly corrosive compound. APB produce organic acids that directly attack metal surfaces. Methanogenic archaea generate corrosive byproducts in the presence of organic matter.

Impact on Oil and Gas Infrastructure

The effects of MIC can be particularly detrimental to the upstream oil and gas industry. Various infrastructure components, such as pipelines, tanks, vessels, and well casings, are susceptible to corrosion caused by MIC. These structures are often exposed to harsh environmental conditions and corrosive fluids, making them more vulnerable to microbial activity.

Corrosion caused by MIC can lead to metal thinning, pitting, cracking, and localized corrosion. These degradation mechanisms can result in leaks, ruptures, and catastrophic failures. Apart from the direct risks to human safety, the environmental impacts of leaks and spills can be significant.

Prevention and Control

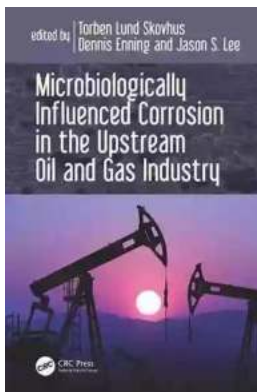
Preventing and controlling MIC in the upstream oil and gas industry requires a combination of proactive measures and regular monitoring. The following strategies are commonly employed to mitigate the risk of MIC:

- **Material Selection:** Using corrosion-resistant materials, such as stainless steel and corrosion inhibitors, can help minimize the impact of MIC.
- **Biocide Treatment:** Applying biocides to control microbial growth and inhibit the formation of biofilms.
- **Cathodic Protection:** Implementing cathodic protection systems to protect metal surfaces by applying an electrical current.
- **Chemical Treatment:** Using appropriate chemicals like oxygen scavengers and scale inhibitors to prevent and control MIC.
- **Regular Monitoring:** Conducting frequent inspections, sampling, and testing of systems and structures to identify microbial activity and take timely

preventive actions.

Microbiologically influenced corrosion poses a significant challenge in the upstream oil and gas industry. Understanding the nature of MIC, its causes, and effective preventive measures is crucial for minimizing its impact on infrastructure, equipment, and the environment. By implementing proactive strategies and regular monitoring practices, industry players can reduce the economic and safety risks associated with microbiologically influenced corrosion.

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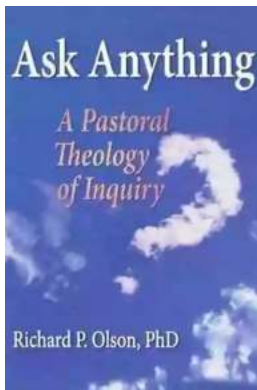
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Microorganisms are ubiquitously present in petroleum reservoirs and the facilities that produce them. Pipelines, vessels, and other equipment used in upstream oil and gas operations provide a vast and predominantly anoxic environment for microorganisms to thrive. The biggest technical challenge resulting from microbial activity in these engineered environments is the impact on materials integrity. Oilfield microorganisms can affect materials integrity profoundly through a multitude of elusive (bio)chemical mechanisms, collectively referred to as

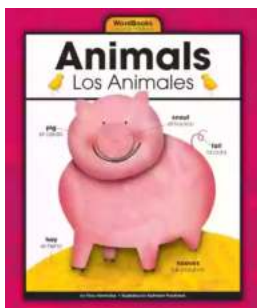
microbiologically influenced corrosion (MIC). MIC is estimated to account for 20 to 30% of all corrosion-related costs in the oil and gas industry.

This book is intended as a comprehensive reference for integrity engineers, production chemists, oilfield microbiologists, and scientists working in the field of petroleum microbiology or corrosion. Exhaustively researched by leaders from both industry and academia, this book discusses the latest technological and scientific advances as well as relevant case studies to convey to readers an understanding of MIC and its effective management.



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