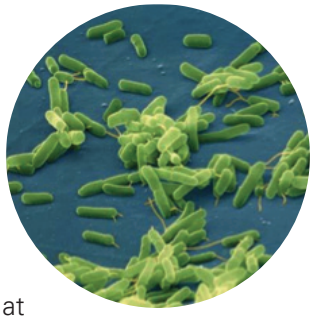
Microbiologically-Influenced Corrosion (MIC) Testing Service: Fast-qPCR Test is Helping the Oil and Gas Industry Turn Around a Multi-Billion-Dollar Problem

How MIC Is Impacting the Oil and Gas Industry

NACE estimates that the cost of corrosion within the oil and gas industry in the United States alone is approximately $27B. Other reports have indicated that **Microbiologically-Influenced Corrosion (MIC) accounts for 20% of total corrosion costs.** With its ability to degrade the integrity, safety, and reliability of pipeline operations, MIC is a major contributor to the corrosion problem and a leading cause of pipe failure. **MIC is becoming an even higher-priority issue for the oil and gas industry with the aging of pipelines and other infrastructure.** Oil and gas facilities are particularly susceptible to MIC-related problems where there is exposure of metals to bacteria found in water. The problem has intensified in recent years with the **growing incidence of reservoir souring caused by the use of water injection treatments for increasing production.**



When a metal surface is exposed to water, microorganisms in the water attach themselves to the inside or external surface of the pipe and gather to form a biofilm. Biofilms can change the electrochemical conditions at the metal- solution interface, inducing corrosion in many ways. **Biofilm can stimulate corrosion through the production of acid, the direct oxidation of iron in pipes, or the production of hydrogen sulfide which can break down protective coatings. Biofilms change the pH and create a physical barrier between anodic and cathodic sites.** Corrosive biofilms shorten the lifetime and lowers the reliability of the pipe or metal surface. Furthermore, as these biofilms grow, cells break loose, move through the pipeline, and re-establish downstream.

Pipeline operators use biocides and other chemical treatments to kill and prevent the growth of corrosion-causing microorganisms. Without accurate information about the microorganisms that are growing on the metal surface, biocide treatments can often be ineffective because the treatments are not targeted. **Once MIC has established itself in a system, it can be nearly impossible to eliminate,** creating a serious and chronic operations problem in a short time. Oil and gas facilities can experience a wide range of MIC-related problems depending on the local environment, operational, chemical and biological factors.

Getting Started with GTI's Genetic MIC Testing Service

Gas Technology Institute (GTI) is a pioneer in applying molecular technologies to MIC detection, and the first one to use qPCR-based techniques. **GTI Testing Laboratories is one of only a few laboratories in the world that offers accredited DNA testing for corrosion-causing microbe populations, and is the first U.S. lab to receive American Association for Laboratory Accreditation (A2LA) accreditation for microbial corrosion testing services.** GTI offers a comprehensive corrosion testing service that directly detects and quantifies (without prior growth) corrosion-causing microorganisms typically found in **pipes, production wells, and other equipment used by the natural gas, petroleum, chemical, water, produced water and wastewater industries.**

Quantitative polymerase chain reaction (qPCR) measures specific genes essential for the metabolism of corrosion causing bacteria in the samples.

A2LA ACCREDITED
Testing Laboratory
CERT # 2139.01 and 2139.04

The method is far more accurate than traditional growth tests and can analyze almost any type of samples (e.g., water, oil/water, solid, oil/solid, dry, old samples, etc.), whether or not the bacteria in the samples are still alive. Historically, MIC testing has relied on detecting corrosion-causing bacteria using microbial growth-based assays that could take up to two weeks to complete. Furthermore, since it's been estimated that only 0.1-10% of the bacteria present in an environmental sample can actually grow, the growth test is unable to accurately detect and quantify target MIC bacteria. GTI's genetic tests can be completed in 24 to 48 hours depending on the number of samples and number of tests and does not rely on whether the organisms are alive or dead.

Currently, GTI offers genetic detection and quantification of eight types of microorganisms that have been implicated in MIC.

> Total Bacteria
> Sulfate-reducing bacteria (SRB)
> Acid-producing bacteria (APB)
> Denitrifying bacteria (DNB)
> Iron-oxidizing bacteria (IOB)
> Total archaea
> Sulfate-reducing archaea (SRA)
> Methanogens

Get To Your MIC Problem Early

Taking a proactive, systematic approach with MIC testing to target treatment strategies can be very cost-effective and efficient. GTI's qPCR technology has been widely recognized in the industry as superior to traditional microbial growth methods of testing for detection and quantification of various microorganisms. GTI can develop an economical, customized MIC monitoring program to meet the specific needs of any pipeline. Beyond providing testing, we can also assist with development of implementation programs. The experts at the GTI MIC facility can help you identify problem areas in all parts of your system—wellhead, injectors, produced water pipelines, and other system—and help you map out areas of greatest concern from a corrosion perspective.

By working with GTI to monitor your system, you can also develop better and more effective mitigation and treatment programs. The point is: Cost-effective MIC management demands early detection. Get to the problem early with the help of GTI scientists. Should you so desire, GTI also offers traditional growth tests, such as the Most Probable Number (MPN) test.

In addition to the genetic tests, GTI scientists and engineers offer failure analysis services, metallurgical testing, chemical testing, and soil classification for internal and/or external corrosion.

For More Information

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