Top 4 Tips for Mitigating and Monitoring Biofouling

Microbial biofouling can have negative effects on any industrial process (mining, paper and pulp, etc.) as well as upstream, midstream, and downstream oil and gas operations. For example, biofouling can impact extraction efficiency, reduce wellbore integrity, restrict fluid flow in pipelines, and lead to microbiologically influenced corrosion of tanks and equipment. Below are our top tips for addressing biofouling:

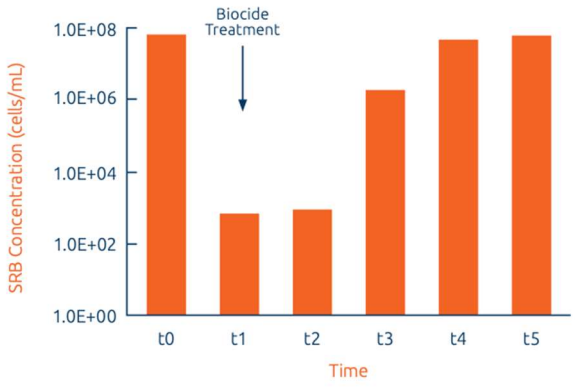
1. **Collect multiple lines of evidence to assess scale and biofouling.** Deposits on equipment and pipes likely have both mineral and microbial components. Determine the composition of the deposit using mineralogical and molecular microbiological methods (MMMs). The results can provide insight into the deposit's origins, methods to treat the issue, and strategies to minimize future recurrences.

2. **Consult with experts and vendors to tailor mitigation solutions to the system processes and material characteristics of the affected asset.** Strategies for controlling fouling include physical cleaning, chemical dissolution, scale inhibitors, biocides, coatings and material selection. If employing a combination of approaches, check with the product suppliers to make sure they are compatible.

3. **Directly measure microorganisms using MMMs for performance monitoring.** After a remedy has been implemented, collect multiple lines of evidence, including microbial data, to evaluate and optimize its efficacy. For example, there's not a universal biocide that will always work under every condition. Over time, microbial populations adapt to conditions, nutrients, and biocides, so continued monitoring of a biocide's effectiveness is needed.

4. **Collect CENSUS® qPCR or QuantArray®-MIC samples pre- and post-treatment.** CENSUS® qPCR and QuantArray®-MIC are molecular analyses that rapidly detect and quantify specific microbial groups and functional genes. Results from MMMs demonstrating a decrease in microorganisms in areas of concern can be a useful indicator of the success of a fouling control program.

   The figure to the right provides an example of using qPCR data for performance monitoring following a biocide treatment. Concentrations of sulfate reducing bacteria (SRB)



decreased by several orders of magnitude after a biocide was introduced into the system. Over time, the SRB population began to rebound with concentrations near baseline levels. These results suggest that another biocide application is needed.

Bonus Tip

Carefully consider what type of sample to collect. Microbial analyses can be performed on nearly any sample type including water, pipe samples, deposit scrapings, pig run solids, and swabs of biofilms. The type of sample you choose to submit depends on the questions you are looking to answer. For example, to assess the microbial contribution to a fouling issue, it is recommended to collect representative samples of the associated solids or swabs of biofilms. To identify the point at which microorganisms are being introduced into a system, it may be beneficial to submit relevant process fluids.

To discuss a project or for more information, please contact Microbial Insights' Project Success Team at 865.573.8188 or info@microbe.com.