Consecutive Treatments Enhance Biocide Efficacy During Water Flooding of Algerian Oilfield

**OVERVIEW**

An Algerian operator found it necessary to employ water flooding for optimal production at two of its mature oil and gas fields. Water flooding is a “secondary” recovery method, whereby water is injected into an existing oil or gas field for pressure maintenance and to stimulate production using produced water and/or source water. In this case, two different approaches were taken:

» At one field, the produced and source water passed through a series of hyper filters before commingling and transferring to two extensive water floods supplied from individual manifolds with typical volumes exceeding 250,000 BWPD.

» The second used coarse filters with direct injection of source water taken from individual wells, transferred to specific injection manifolds feeding a combination of injection and dilution water wells. Treated saline produced water was commingled at some of these manifolds with total injection water volumes exceeding 175,000 BWPD.

The bulk injection water was comprised of a combination of saline produced water diluted with aquifer water. However, both the source water and injection water systems were susceptible to the adverse effects of microbial activity, requiring regular biocide treatments to maintain bacteria control and prevent biofouling. The operator’s main concern was regarding injectivity loss and corrosion of the manifolds and flowlines. Multi-Chem’s biocide treatment proved to be what was needed to mitigate these issues.

**BIOCIDES TREATMENTS**

Three Multi-Chem biocides were applied individually on a weekly basis, with onsite monitoring to ensure effective treatment. Multi-Chem field engineers were deployed to each location to manage the implementation and provide services for the project. They performed routine weekly lab analyses to evaluate microbial activity before and after biocide treatments, using a combination of traditional serial dilution and ATP analyses to enumerate bacterial numbers. Specifically, measurements were taken of total microbial activity (ATP), and enumeration of sulphate reducing, thiosulphate reducing and acid producing bacteria with the appropriate serial dilution media.

The Multi-Chem team in Algeria provided comprehensive support of the mitigation and monitoring program. Field engineers at both locations supervised execution of the treatment program and evaluated the distribution and efficacy of the biocide, rigorously applying continuous improvement to address any deficiencies.
MICROBIAL CONTROL: WATER FLOOD SITES VERSUS PROCESS FACILITY

The original biocide treatment program, with weekly applications alternating between the three biocides recommended, provided continual effective microbial control at the water flood sites. However, microbial numbers at the process facility remained at or above target levels (10^3 col/mL). Further improvement was accomplished by consecutive application of all three biocides on a weekly basis, reducing bacteria numbers in the process facilities to well below that target. The lower levels achieved in the process facilities paralleled the low microbial numbers previously only observed in the water flood, itself.

Bacteria count is well controlled with Multi-Chem biocide treatment and monitoring. Performance demonstrated improved growth inhibition of SRB (top), TRB (middle) and APB (bottom).