

## THE RENEWIQ™ SOLUTION - BIOC16779A BIOCIDES MANAGES MICROBES AND RECONDITION WATER FOR MANCOS SHALE WELLS



### SITUATION

An operator was using multi-stage hydraulic fracturing treatments to complete wells targeting unconventional crude oil and natural gas in the Mancos Shale of New Mexico and Colorado's San Juan Basin. The cost of acquiring and managing the large volumes of water needed for hydraulic fracturing treatments, in an area with limited water resources, was increasing steadily as better recovery economics-enabled by hydraulic fracturing technology-attracted more operators to the Mancos Shale play. As a result, the incentive to reuse water increased as drilling and completion activity accelerated.

### CHALLENGE

To deal with the San Juan Basin's limited water resources, the Mancos Shale operator recycled fracturing fluids and produced water for reuse in some stages of completions. However, reusing water in all completion scenarios was not desirable due to concerns regarding the stability of fracture-fluid gels. As a result, the operator typically paid premium prices for high-quality water for selected stages of completion, to ensure fracturing fluids would perform

as intended. Nevertheless, that strategy was reaching a breaking point due to the increasing difficulty and escalating cost of acquiring enough water to support drilling and completion activity.

### SOLUTION

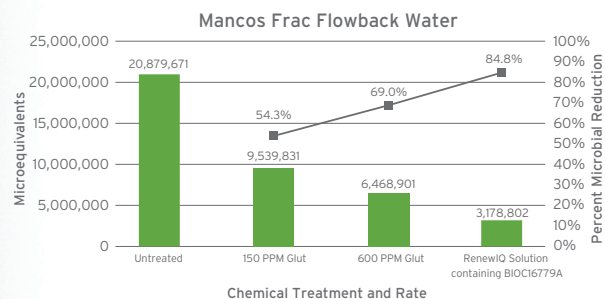
Nalco Champion began its investigation by collecting samples of fluids present in the field and identifying incumbent chemicals being used by the operator to manage water issues. A series of performance tests were conducted locally and at the research laboratory in the Nalco Champion North American Technology Center at Sugar Land, Texas, to assess the efficacy of current and potential biocides simulating conditions found in the field.

Based upon technical considerations, testing results, and past experience, Nalco Champion concluded that a RenewIQ™ solution based on BIOC16779A biocide, was an ideal product to alleviate the concerns and issues involving the reuse of fracturing fluids and produced water in the Mancos Shale.

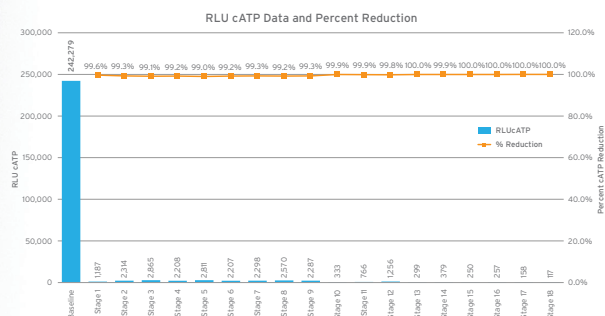


## RESULTS

Before replacing the incumbent glutaraldehyde-based biocide with BIOC16779A biocide, Nalco Champion conducted a preliminary microbial kill-study to validate product selection. In the study, the RenewIQ solution containing BIOC16779A showed better antimicrobial performance compared to 600 ppm of the incumbent biocide.

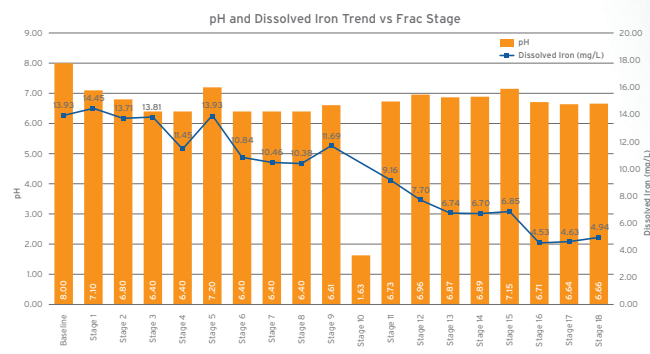


During application of the BIOC16779A biocide in a multi-stage hydraulic fracturing completion, samples collected at the blender tub indicated actual microbial reduction to be 99 percent or greater for all stages of the fracturing treatment, compared to untreated water samples.



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In addition to impressive microbial reductions, dissolved iron counts steadily decreased as additional flocculant was added and circulated into the water. This was quantified by laboratory methods as well as visual comparisons upon sampling.



Untreated vs. treated water with BIOC16779A.

Since replacing the incumbent biocide with RenewIQ solution BIOC16779A biocide, the Mancos Shale operator has realized a 25-percent reduction in total water-treatment cost. Additional savings have accrued from better water management in the form of reduced water-hauling charges, lower water-purchasing costs, and minimized water-disposal fees. These logistical savings have amounted to \$15,000-to-18,000 for every 10,000 barrels of water repurposed.