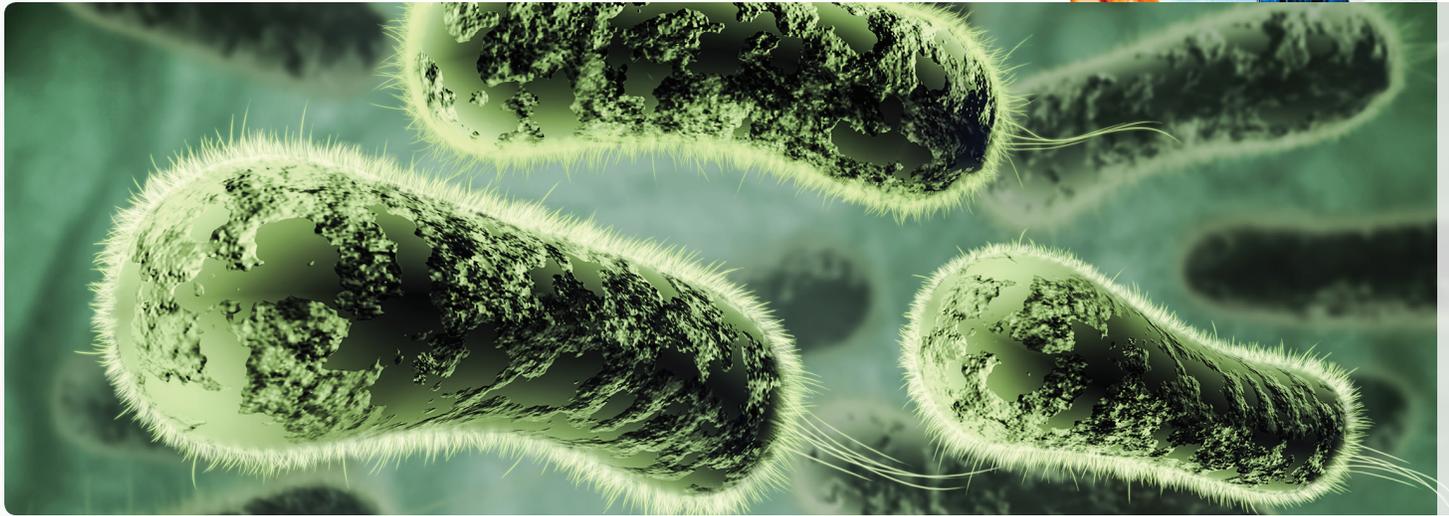


PIT WATER MICROBIAL CONTROL PROJECT USING RENEWIQ™ SOLUTION - BIOC16734A BIOCIDES



BACKGROUND

A major producer was using municipal water for its hydraulic fracturing operations. However, the municipal water ultimately became cost-prohibitive, forcing the company to switch to well water. Holding pits were constructed to store that water. The holding pits were designed to be equalized, simulating one large pit.

SITUATION

The producer found that the new source water had much higher levels of sulfates and bacteria and a higher scaling tendency than the municipal water that it had used in the past. This was most likely attributable to the irregular flow of water through the pits. There were times when the pits were turned over quickly as the source wells fill the pit and water was pulled out simultaneously for fracturing jobs. There were also long periods of stagnation, during which no water left the pits. The presence of sulfates, bacteria, and stagnation was alarming because sulfate-reducing bacteria (SRB) reduce sulfates to create H_2S . If the bacteria level was not controlled, the formation could sour, creating a major production issue for the producer. A chemical treatment program was needed to keep the pits at low microbial levels throughout the pit-use cycles in an automated manner, with minimal oversight.

SOLUTION

Samples of fresh and pit water were collected with the goal of identifying an optimized pit biocide treatment program that would continuously treat all influent water (see Figure 1). After extensive testing of the water in the holding pits, the Nalco Champion RD&E team recommended a RenewIQ solution that included BIOC16734A biocide in order to achieve the best microbial kill level for pit water as well as the best residual activity. BIOC16734A biocide oxidizes proteins in microbial cells for its biocidal kill mechanism. It is a rapidly-reacting, broad-spectrum biocide with post-oxidation byproducts of water and acetic acid. Safety is always a Nalco Champion priority. Testing was performed to determine isolated dosing locations for the chemicals to ensure operator and equipment safety for the application.

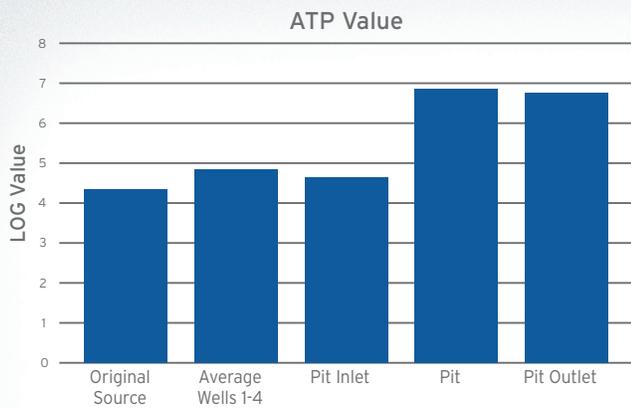


Figure 1 - Comparison of the bacteria levels (measured by the ATP method) in the original municipal source, the wells, and in the pit without treatment. Bacteria levels are shown to increase significantly when left untreated.

RESULTS

Results of testing showed that optimal treatment was achieved through the use of the RenewIQ solution which contained BIOC16734A (see Figure 2). Continuously treating the influent water with this formulation provided maximum biocidal efficacy for influent water, plus as a residual benefit it ensured continued activity during times that the pit was not being used for fracturing operations.

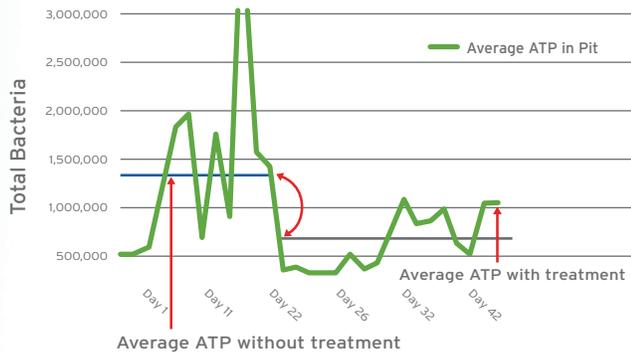


Figure 2 - Shows average ATP data before and after treatment. The initial concentration of BIOC16734A was high but the concentration was lowered to the continuous level. The trial demonstrated Nalco Champion's ability to economically manage the customer's microbial risk.

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Pre-Treatment



Post-Treatment with the RenewIQ Solution which included BIOC16734

CONCLUSION

The RenewIQ solution containing BIOC16734A was very effective in keeping the microbial levels within control in the pits. The average cost of pit water treatment was <\$0.07/ barrel, as shown in Figure 3, which included the cost of the chemical as well as analytical costs and manpower. The combined chemical program was tremendously valuable to the customer's operation, exceeding expectations from both a performance and cost standpoint.

For more information on this RenewIQ solution pit water control project, please contact your local Nalco Champion associate.

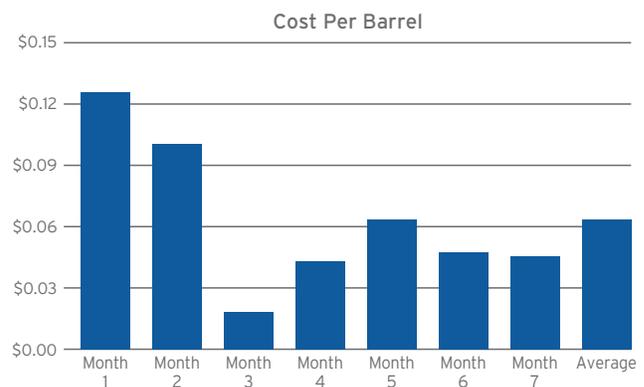


Figure 3