

RENEWIQ™ BIOC16779A SOLUTION PROVIDES BETTER RESULTS FOR WATER REUSE FROM MULTIPLE SOURCES IN REMOTE FRAC LOCATION



BACKGROUND

Nalco Champion has been supporting frac applications with RenewIQ™ biocide solutions for over two years. Customer frac water applications have ranged from treating water in the blender tubs, to treating ponds and frac tanks staging water. RenewIQ™ has been effective in all of these applications. The frac water sources have ranged from 100 percent fresh water, to a blend of fresh and produced water, to almost 100 percent produced water.

The reuse of flowback and produced water in oilfield applications has been increasing in recent years. This increase is driven both by water scarcity, changing legislation and economic reasons. As the cost of fresh water increases, especially in areas of low annual rainfall, and as the cost of disposing flowback and produced water continues to increase, the industry has been looking for ways to economically reuse water.

Benefits from RenewIQ™ solution applied to frac applications include:

- Reduced water handling costs
- Minimized environmental impact
- Reduced fresh water usage
- Reduced waste water going to SWD and associated costs
 - possible downtime if customer is unable to get rid of water efficiently
- Better quality water for frac reuse

As demand and cost for fresh water increase, the use of Nalco Champion's RenewIQ™ solutions has been shown to be a viable option in reusing flowback and produced waters allowing for:

- Effective microbial control
- Cost reduction (frequently more effective than conventional biocides)
- Safety (H₂S reduction)
- Water quality improvement (FeS reduction)

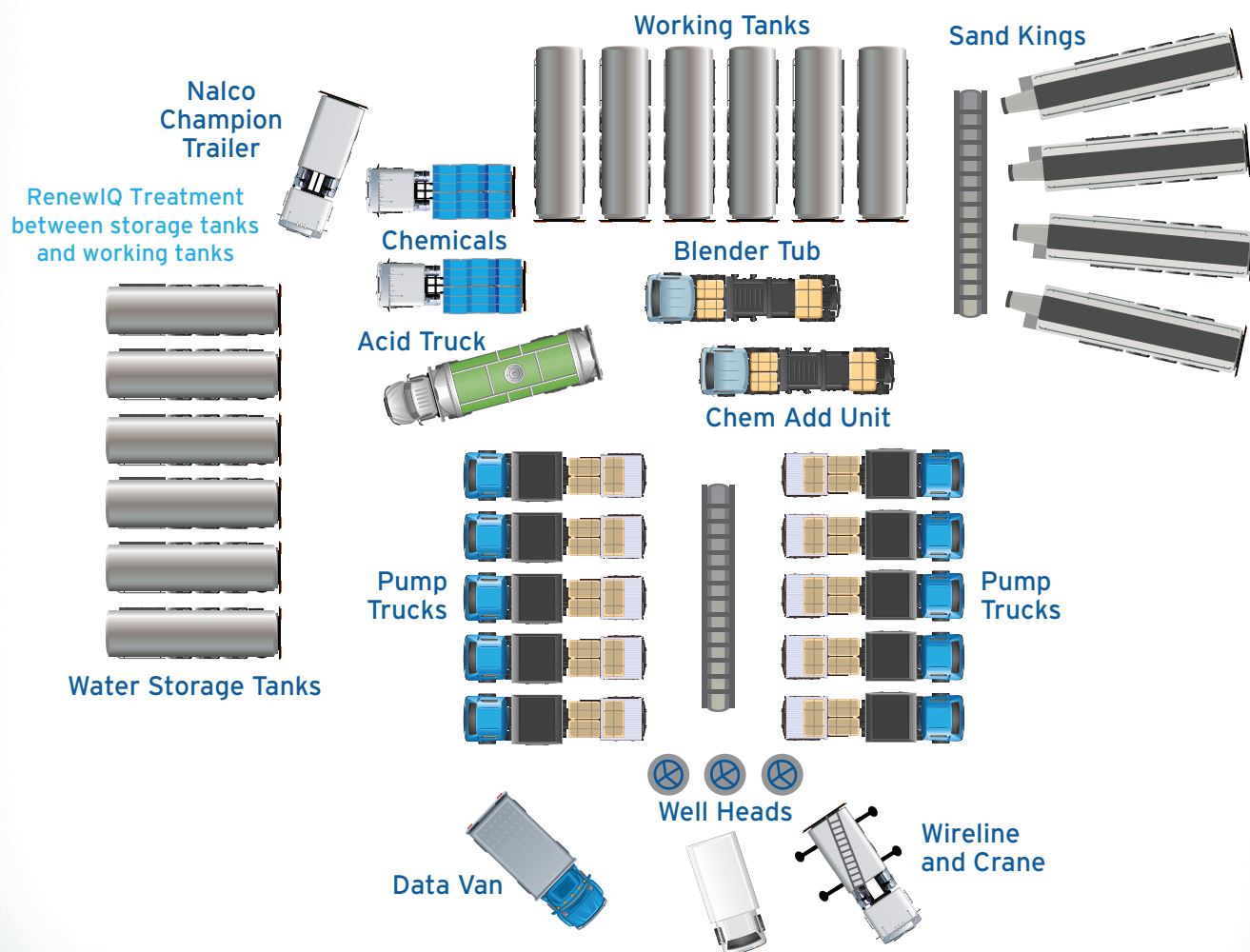
SITUATION

An oil and gas producer operating in the Rockies previously used traditional biocide packages during hydraulic fracturing operations to prevent fouling and corrosion due to microbiological activity. To minimize fresh water usage during the frac application, the customer used a combination of fresh, produced and flow-back water to frac new wells.

This case history describes a four-well pad. The customer would rotate their frac schedule across all four wells, fracing two wells per day (one stage per well per day) and then collecting the flow-back at night during periods of inactivity (stack fracing). The flowback was only a fractional amount of the total water volume needed, so it was mixed with produced water from other wells and fresh water from a local source.

CHALLENGE

The two major customer concerns when fracturing these wells were bacteria that can reduce sulfates and create hydrogen sulfide (H_2S), and iron in the water, which can precipitate and plug the reservoir. Nalco Champion's best practice involves treating all water that is introduced during completions with a biocide to minimize bacterial contamination of the wellbore. This customer typically used a non-oxidizing biocide in conjunction with sodium hypochlorite to control bacteria in the frac water; however, they were starting to see an increase in H_2S and iron sulfide levels on some wells that had been completed several months earlier using traditional methods.



Nalco Champion injected RenewIQ™ in the transfer line between the Water Storage Tanks and Working Tanks.

RESULTS

Microbial testing for this application was done primarily with Nalco Champion's AccuCount Microbial Test kits, which provide rapid results compared to traditional test methods (minutes vs. weeks). Unlike traditional test methods that require growing microorganisms and only detect a small fraction of the microbial population, the AccuCount test method detects all active microorganisms and dormant microorganisms via ATP/AMP measurements.

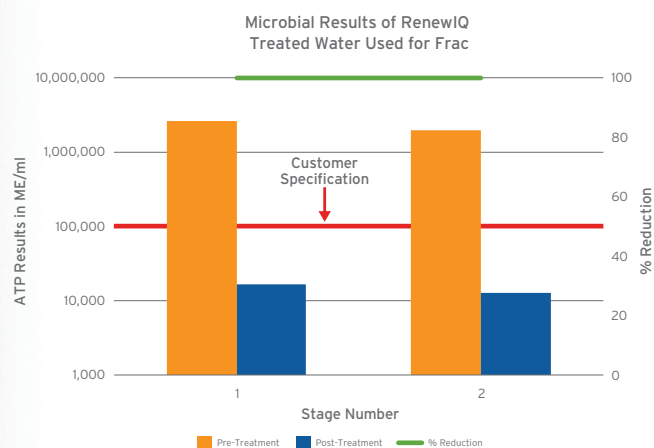


Figure 1 - Microbial results of RenewIQ treated water used for frac

The results of microbial testing using Nalco Champion's AccuCount unit showed that the RenewIQ™ application significantly reduced the microbial load on the blended fresh/produced/flowback water used in the frac application. The RenewIQ™ biocide reduced the microbial load by 99.3 percent (comparing the untreated water to the treated water), meeting customer requirements.

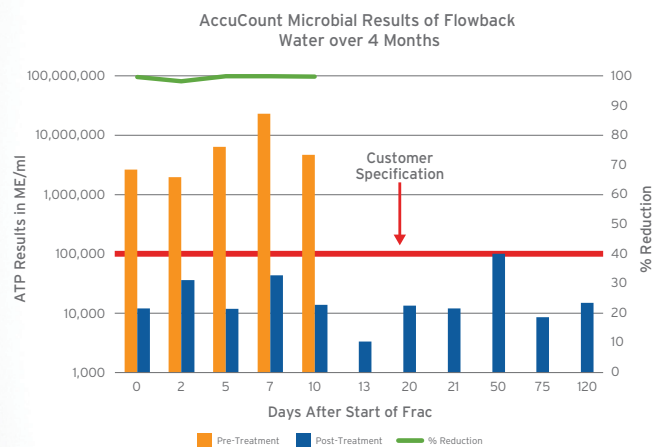


Figure 2 - AccuCount microbial results of flowback water over 4 months

The microbial results from the AccuCount testing on the flowback water showed that the RenewIQ™ biocide treatments reduced the microbial load to below the customer's criterion of 100,000 ME/ml and that the flowback water remained at this level for at least nine months (the most current results available at time of publication).

Well	Results SRB Bottles Turned	Results APB Bottles Turned
A	0	0
B	0	0
C	1	2
D	0	0

Table 1 - Flowback water test results; nine months after fracing with traditional bug bottles

Microbial results using traditional bug bottles, listed in Table 1, showed no bacterial growth after nine months.

CONCLUSION

The RenewIQ™ solution applied during a fracking operation in the Rocky Mountain region of the United States was able to save the customer more than 25 percent compared to the use of traditional biocides (previous frac operations) while meeting the customer microbial specifications and addressing concerns of H₂S and iron sulfide.

The RenewIQ™ solution allowed the customer to reuse produced and flowback water in fracing operations by effectively controlling microorganisms, including SRBs, in the different water streams.

RenewIQ™ helped the customer:

- save money on chemical cost
- effectively reduce microorganisms to an acceptable level, reducing concerns of H₂S from SRBs
- reduce fresh water usage and water disposal costs, providing environmental and cost savings benefits

Together, We're Taking Energy Further™

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