

First Successful Proppant Fracturing Using TSE-Based Frac Fluids for Unconventional Carbonate Source Rock in Saudi Arabia

Ali A. Al-Taq¹, Mohammed Al-Khalidi¹, Karim Mechkak¹, and Basil Alfakher²

¹EXPEC ARC, Saudi Aramco, Dhahran, Saudi Arabia.

²Saudi Aramco, Dhahran, Saudi Arabia.

ABSTRACT

Fracturing operations consume relatively large amounts of fresh/ground water, especially in unconventional resources. In attempts to conserve ground water, treated sewage effluent (TSE) was evaluated/optimized for frac treatments to provide required transport property for proponent and not induce formation damage (hence, compatible with formation brine). Extensive lab work has been conducted including viscosity measurements, compatibility testing and microbial study to optimize acid-based frac fluids for unconventional operations. Based on laboratory recommendation, TSE-based frac fluids have been applied successfully on Well-A. Twenty stages unconventional prop fracture stimulation utilizing perf-n-plug (P-n-P) technique across the source carbonate rock have been applied successfully. Two base fluids which were treated fresh water and TSE (each water was used for 10 stages) were used to evaluate the effectiveness of TSE as a substitution for the fresh water in unconventional fracturing operations. Post frac production results of well-A showed very good performance compared with offset wells treated only with fresh water-based frac fluids and there was no evidence of scaling issues during flow-back period. A production log was run in this well and based on stages contribution it was concluded that TSE frac stages had better production than fresh water frac stages. Microbial evaluation of water samples collected during flow back of Well-A showed no presence of bacteria in these samples. This paper will discuss in detail the lab work performed and briefly the field application.