ABSTRACT

The primary purpose of friction reducers (FR's) used in stimulating shale reservoirs is to overcome tubular friction pressure and establish high pumping rates. Slickwater (or water frac treatments where friction reducers are used as main source of reducing tubular pressure) fracturing has increased significantly with the advent of horizontal shale stimulation. Technologies, including multi-stage fracturing of horizontal wells have increased frac volume requirements per well. Recent restrictions limiting fresh water usage and environmental concerns of flowbacks have created challenges for operators to adopt mechanical and chemical water treatment means to remove impurities from flowbacks for reuse in slickwater fracturing. However, most treatments do not remove brines from the water requiring development of high brine tolerant friction reducer to maintain high performance.

This study presents experimental and case studies of various cationic and anionic FR's of the similar molecular weight in high brine flowbacks collected from two major shale plays. Finger print water analyses of shale reservoirs were used as brine source for evaluation. Dynamic friction loop flow apparatus was used to evaluate the rheological properties and formation damage of the FR where high brine waters are being used as the main source of slickwater fracs.

Field data collected for two case histories document the ability of the high brine tolerant friction reducers to perform at a level consistent with traditional products used in fresh water. This confirms the experimental flow data obtained from dynamic friction loop investigations. Results obtained from this study can be used to optimize slickwater frac treatments where flowbacks are the main source of frac water. Primary objectives include:

- Comparison studies of new high brine tolerant friction reducer with conventional FR's used in the oilfield.
- Experimental data illustrating the performance of newly developed FR's in high brine shale flowbacks. Cost advantage can be realized by using less polymer, while reducing fresh water and disposal of the flowbacks. (will be addressed at a later publication)
- Case studies of wells treated with the new friction reducers show performance in brines similar to these achieved with conventional FR's when used in fresh water.

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