PREVENTION OF ACID INDUCED ASPHALTENE PRECIPITATION: A COMPARISON OF ANIONIC VS. CATIONIC SURFACTANTS

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ABSTRACT
With the recent proliferation of horizontal drilling specifically targeting oil bearing reservoirs, high strength acid fracturing treatments in the Beaverhill Lake formation in northern Alberta have dramatically increased in both product volume and number of treatments. The Beaverhill Lake formation is a limestone/calcareous shale that produces a desirable mid to high API sweet crude oil. Although the crude oil typically has a low concentration of asphaltenes, the oil is very sensitive to acid and/or iron induced asphaltene precipitation. As the acid strength increases and ferric iron is dissolved into solution, it becomes increasingly difficult to chemically prevent the asphaltenes from precipitating. Acid blends designed to prevent asphaltene precipitation also tend to be very emulsifying with the crude oil, therefore a careful balance between anti-sludge additives and non-emulsifiers must be found.

This paper will describe the chemistry of surfactants that can be used to prevent asphaltene precipitation as a result of acid/oil contact. Specifically, a comparison of anionic versus cationic surfactants will be given, describing both the benefits and detriments of using these in acid blends. A discussion of the change from vertical well completions in the Beaverhill Lake formation to horizontal multi-zone completions will be presented. As a result of this change in completions, the desired properties of the acid blends have changed notably. The final results of a comprehensive laboratory study to optimize cost and performance of the acid blends will be presented. A review of field case studies comparing formation response to anionic and cationic acid blends will also be presented.

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