Evaluation and Characterization of Bio-Polymers for Spacer Fluid Application

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Abstract
In this study, the effect of bio-polymer on the spacer fluid behavior was investigated. Three bio polymers: P1 (generally used as treating agent while drilling), P2 (viscosifier and cuttings carrying agent) and P3 (controlling agent in oil well drilling to facilitate easy drilling and prevent fluid loss) were characterized based on their rheological and filtrate loss properties. The results showed a higher viscosity, density and lower fluid loss values for bio-polymer P3 based spacer fluid.

1. Introduction

Achieving successful zonal isolation is an important step during oil/gas well drilling operations. The spacer must isolate drilling fluid from cement slurry to avoid development of large interval of contaminated cement which would lead to severe consequences of gas migration [2, 4]. Also, the fluids and solids lost from slurries can cause damage by entering the formation and reducing their permeability which in turn decreases the productivity. Hence, to avoid all these situations, a proper spacer mix should be employed before the cement is pumped.
This study comprises the comparison of the rheological and filter loss characteristics of the three bio-polymer based spacer fluids.

2. Objective

The objective of this study was to develop, characterize and evaluate the performance of spacer fluids with bio polymers P1, P2 and P3.

3. Material and methodology

In this study, three types of bio-polymers were evaluated. Polymer P1 is used mainly in food industry, Polymer P2 is commonly used to enhance cutting transport capabilities of drilling fluids and Polymer P3 is used mainly to enhance the viscosity for borehole maintaining friction reduction and lubrication in drilling fluids [3]. In recent times, these polymers are used in spacer fluids also. The composition of the spacer fluid was: 2% (by wt. of water) biopolymer as the base material, 10% by wt. barite as weighting agent along with 6% by wt. NaCl salt. Rheology studies-viscosity, yield point, shear stress was obtained using a viscometer device and density of spacers was also measured. Filtration loss test was done using the HP/HT apparatus at ambient temperature under 100 psi pressure.

5. Discussion

As shown in Fig. 1 bio-polymer P3 based spacer fluid had a higher viscosity when compared to other bio-polymers. Fluid loss test showed a lower spurt as well as 30 minute fluid loss for all the bio-polymers, with a slightly lesser value for P3 based spacer (Fig. 2). For a spacer fluid, density is an important factor [4] and should lie between that of drilling fluid and cement slurry. Polymers P2 and P3 based spacer readily satisfied this criteria whereas for polymer P1 did not (Fig. 3).

4. Results

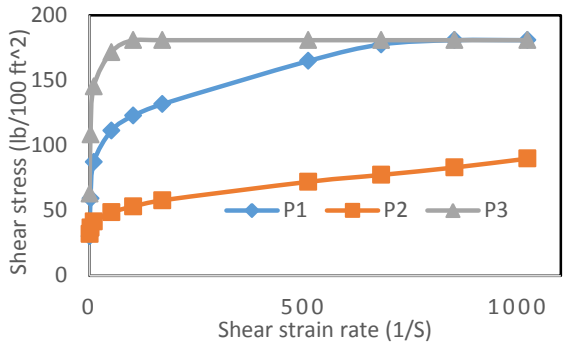

Figure 1. Shear rate Vs. Shear stress

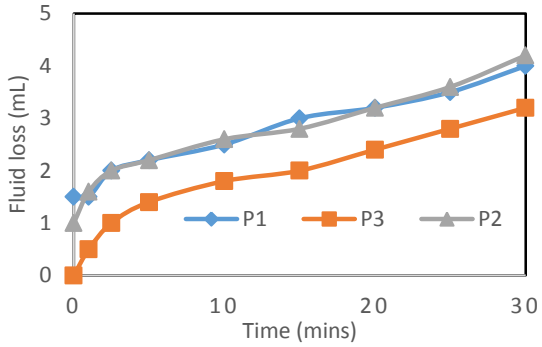

Figure 2. Plot of fluid loss vs. time

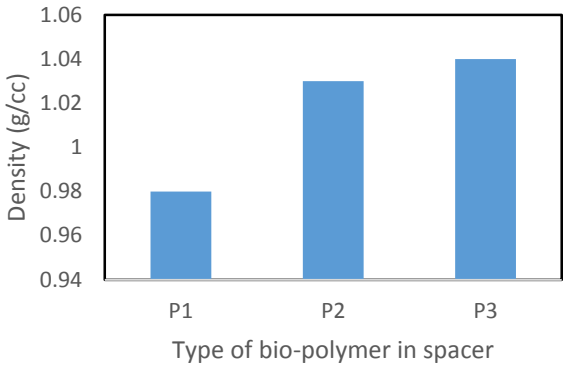

Figure 3. Density of the spacers

6. Conclusion

Bio-Polymer P3 based spacer fluid showed higher viscous, lower fluid loss when compared to P1 and P2 bio-polymer based spacers.

7. Acknowledgement

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8. Reference

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