Effect of Biopolymer Powder on the Fluid Loss and Resistivity of Water Based Drilling Mud

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Abstract: The fluid loss in drilling mud has been considered as one of the main challenging issues of drilling boreholes in different types of formations. Hence, the effect of using a biopolymer powder to reduce the fluid loss in 4% bentonite drilling mud was investigated. By adding 3% biopolymer powder the fluid loss was reduced by about 80%.

1. Introduction: The properties of the drilling mud are significantly influenced by the water content. One of the challenges in the oil and gas industry is fluid loss. Additives help operators retain the characteristics of drilling mud, including viscosity, thickening time and density development. In this study, due to environment friendly characteristics of biopolymers, a biopolymer was used in water based drilling mud which has the capability of holding water. Moreover, the thickening characteristic of this powder would help in order to decrease the amount of filtration (Mirhosseini and Tabatabaee, 2012)

2. Objective: The main objective was to quantify the changes in filtration before and after adding the biopolymer powder to the water based drilling mud and observe the effect of this powder on the drilling mud. Also the resistivities quantity changed due to the adding of biopolymer powder to water based drilling mud.

3. Materials and Methods: Water based drilling mud (WBM) with 4% of bentonite was used. Also 1% and 3% of biopolymer powder was used in water based drilling mud (WBM) with 4% of bentonite. API fluid press was used to measure the fluid loss. The ambient temperature with application of 100 psi pressure were the conditions of these experiment. Figures 1 shows the schematic test detail for API filter press test.

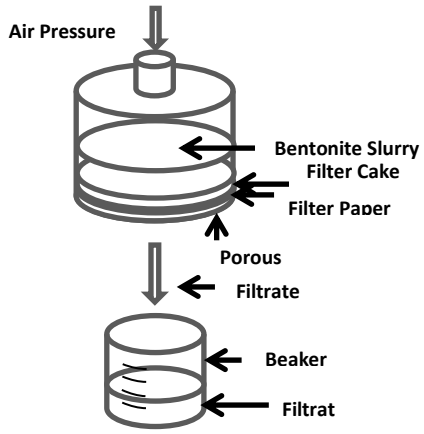

Figure 1. Schematic test detail for API filter press test

4. Results and Analyses: The fluid loss decreased after adding biopolymer powder to the water based drilling mud. By adding 3% biopolymer powder to 4% bentonite water based drilling mud, the fluid loss (30 min) decreased from 24.3 mL to 6.8 Ml, about 80% reduction (Fig. 2). By adding 3% of

biopolymer powder to 2%, 4% and 6% bentonite water based drilling mud, the resistivity decreased about 37%, 23% and 16%, respectively. By increasing the biopolymer the resistivity decreased while with increasing bentonite the resistivity decreased as well (Fig. 3).

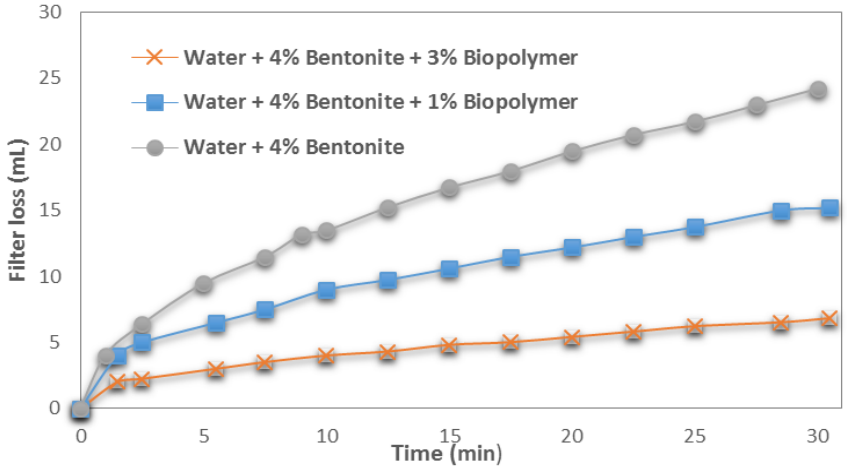

Figure 2. The fluid loss of 4% bentonite water based drilling mud by adding Biopolymer

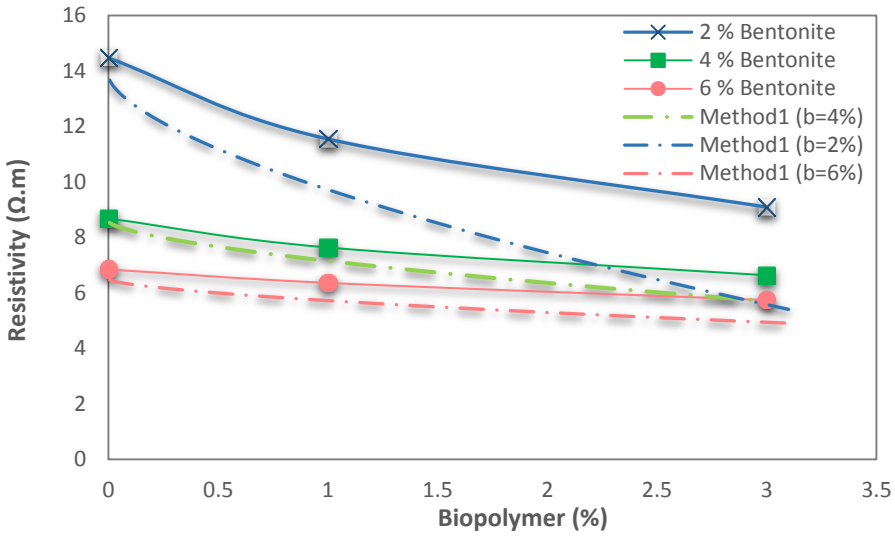

Figure 3. Resistivity of different percentages of bentonite versus biopolymer percentages

5. Analysis: The resistivity (ρ) biopolymer (F) powder and the amount of bentonite (B) in the drilling mud as follows: $\rho = 0.9365B^{-0.688} - 0.0107F^{0.6365}B^{-1.5203}$

6. Conclusion: The fluid loss decreased (about 80%) by addition of biopolymer powder due to its water absorption capability. The resistivity was sensitive to the biopolymer in the drilling mud.

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8. References:

1. Mirhosseini, H., and Tabatabaee Amid, B., (2012), "A review study on chemical composition and molecular structure of newly plant gum exudates and seed gums", Food Research International 46:387–398.

2. http://www.halliburton.com/en-US/ps/cementing/materials-chemicals-additives/fluid-loss-