

Effect of Sodium Chloride Contamination on the Filtration Loss of an Ester based Drilling Fluid

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Abstract

The effect of Sodium Chloride salt (NaCl) contamination, which would likely occur during a natural disaster in the offshore drilling site; was studied on the filtration loss of an ester based (60% ester, 40% water) drilling fluid. The experiments were performed at a constant room temperature. The fluid loss was studied following API standards by varying the concentration of Salt from 0 to 20%. The presence of salt brought in considerable increase in the filtration loss.

1. Introduction

Synthetic drilling fluids (SBF) also referred to as pseudo-oil-based inert and non-aqueous drilling fluids are good alternatives to oil based drilling fluids because they do not have the aromatic compounds and hence are less toxic. Esters were the first synthetic base used to formulate the drilling fluids. Ester based drilling fluid system gained its importance in the Oil&Gas industry during the 1990s mainly due to its high bio-degradability and environmental-friendly characteristics. Due to excessive usage of oil, drilling is going deeper into the ocean and drilling is done on a larger scale, hence exposing the drilling operations to likely naturally occurring disastrous conditions. Hence, it is necessary to evaluate the performance of drilling fluids at different level of contamination conditions. In this study, stability of an ester based drilling fluid system against salt contamination which could possibly occur during any disaster like hurricane has been attributed to the fluid loss property measured.

2. Objective

The objective of this study was to determine the effect of Sodium Chloride salt on the filtration loss of an ester based drilling fluid (60% ester, 40% water) at 100psi pressure and room temperature.

3. Materials and Methods

Soybean oil based Fatty Acid Methyl Ester was synthesized in the laboratory using trans-esterification process at room temperature. The control sample of the ester based drilling fluid had 60% ester and 40% water with an admixture of 0.2% additive by weight of the ester. Having made a homogeneous mixture of water and ester by mixing it for 60 seconds, Sodium Chloride salt (NaCl) was added as a % by weight of water content in to the drilling fluid and was varied from 0 upto 20%. An upper limit of 20% was used in this experimental program since it is very close to the complete solubility limit of NaCl salt in water. All samples were prepared and tested at room temperature. Fluid loss (mL) of all the samples was measured using API Filter Press. All samples were subjected to a constant pressure of 100psi during the test.

4. Results and Discussions

As shown in Fig.1, the fluid loss of the ester based drilling fluid increases drastically with the presence of NaCl. It is interesting to note that greater increase was found with lesser percentage contamination of NaCl i.e. 5% while a considerable reduction was observed when 10% NaCl was added. Also, lesser change in filter loss was recorded on addition of 10% salt than that of 5%.

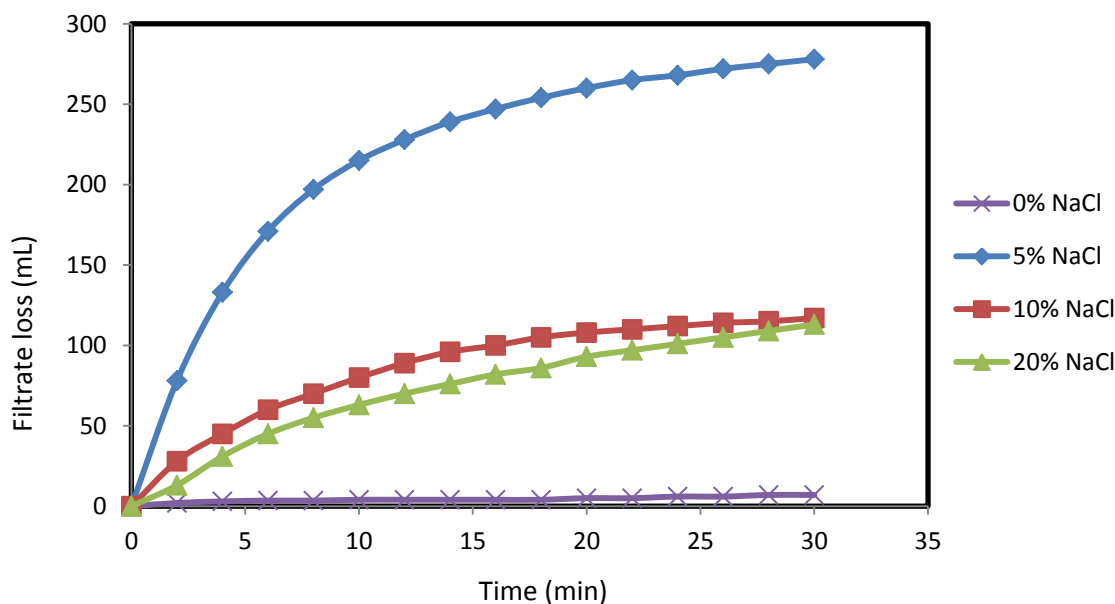


Fig.1. Variation of API filtration loss with time for samples with constant of ratio ester to water as 60/40

5. Conclusion

It was found that presence of Sodium Chloride salt (NaCl) considerably affected the filtration property of the ester based drilling fluid. Even though the loss was not of acceptable standards, it reduced considerably with an increase in the concentration of salt after 5%. Also, upto 5% salt contamination seems to be detrimental to the filtration properties of Soybean oil Fatty Acid Methyl Ester based drilling fluid.

6. Acknowledgement

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7. References

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