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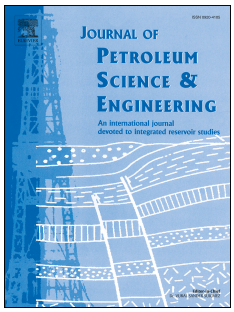

Interaction of blockers on drilling fluids rheology and its effects on sealing of fractures and prevention of filtrate invasion

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Interaction of blockers on drilling fluids rheology and its effects on sealing of fractures and prevention of filtrate invasion

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ABSTRACT

Drilling fluids from oil wells play an important role in the drilling operations, including cleaning and maintaining well stability, as well as cooling and lubricating the drill bit. Invasion of fluid in the rock formation, through natural or induced fractures, can compromise the entire well. In this work we evaluated the effect of combination of viscosifiers xanthan gum (XG), carboxymethylcellulose (CMC), Hydroxypropylstarch (HPS) and bentonite in the interaction with lost circulation materials diatomaceous earth (DE) and hydrogel (HG). The main objective was to obtain a product with adequate rheological properties showing viscoelastic behavior and minimizing loss of fluid to the wellbore. Tests of X-ray diffraction (XRD) and zeta potential were performed to analyze the interactions between the particles present in the fluids. With rheological tests we studied the effects of the addition of different components on the fluid rheology. XRD technique showed that the bentonite deflocculated only in polymer suspensions with DE. The results of zeta potential suggest that only the fluid with Hydroxypropylstarch and HG was completely flocculated and unstable, showed through particle sizes distribution tests. The gel modulus (G') and viscous modulus (G") of the fluids were affected by the interaction of bentonite layers with lost circulation materials particles, with significant increase of G' with the addition of HG to the suspension. There was a decrease of viscosity due to agglomeration of HG and DE particles, an increase of G' can be observed as well. Among all the fluids, the suspension of CMC and bentonite showed better affinity with the HG lost circulation material, presenting thermal stability and a wide range of particle size, essential property to avoid the loss of fluid through the fractures and pores of the rock formation.

Keywords: Drilling fluids, Lost Circulation and Loss Control Material.

1. Introduction

Offshore drilling is an extremely expensive operation. It is essential to minimize drilling time and irreversible damages to the reservoir (Waldmann *et al.*, 2014). The drilling method in rock formations consist of the downward movement of a rotating drilling column with a steel drill bit that cause rock fragmentation. Drilling fluids are injected into the well to bring rock fragments (cuttings) to the surface disposal and to lubricate and cool the bit. The existence of a positive pressure differential inside the well is one of the main causes of fluid loss (Waldmann *et al.*, 2014), generating additional costs and, in extreme situations, jeopardizing the completion of drilling (Duque *et al.*, 2015). The fluid loss is typically very high, almost 10 barrels (1 barrel = 0.16 m^3) per hour in carbon rocks (Alsaba, *et al.*, 2016; Sensoy *et al.*, 2009).