

عنوان مقاله:

Laboratory Analysis of the Rheology of a Polymer-based Mud Produced from Magnetic Water as a Fluid Used in Oil Well Drilling

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خلاصه مقاله:

This study investigated the application of iron oxide nanoparticles in the presence of an external magnetic field to control the rheology of drilling fluids. Drilling fluid rheology is one of the most critical factors in determining the optimal fluid. Drilling fluid must have good rheological properties to carry the drilled cuttings. On the other hand, polymers in the water-based drilling fluid control fluid loss. In low-density oil-based fluids, where the water content is low, rheological control is generally difficult since there is a limitation in selecting additives. In this study, the ferromagnetic fluid has been generated by adding nanoparticles of Fe_3O_4 to silicon oil. By adding ferromagnetic fluid to the oil-based mud under the influence of the external magnetic field, we examined the rheological behavior of the oil-based drilling mud. The external magnetic field can be applied in actual conditions in the middle of a magnetic drilling string. The results showed that the magnetic nanoparticles improved the drilling mud rheological properties. Moreover, the viscosity of the oil-based fluid without nanoparticles was measured 2 cP and increased to 33 cP by adding 4 wt % of iron oxide nanoparticles under an external magnetic field of 0.32 T. The magnetic field was also used for water-based mud (WBM), and the results showed that in water-based fluids containing polyanionic cellulose (PAC) polymer, the magnetic field did not have much effect on the rheological properties of the drilling mud compared to oil-based mud (OBM). Since water is the main component of the water-based fluid, increasing the magnetic field reduces the viscosity of the water-based fluid. The magnetic field increased fluid's rheology by adding iron oxide nanoparticles to the polymer-based fluid. The viscosity of the water-based fluid containing nanoparticles increased to 850 cP under the magnetic field.

کلمات کلیدی:

drilling fluid rheology, ferromagnetic fluid, Iron oxide nanoparticle, Magnetic field

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