

Effect of Organophilic Clay on the Stability and Rheological Behavior of Oil-Based Drilling Muds

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Abstract : The major problem with oil-based drilling muds (reverse emulsions) is their thermodynamic instability and their high tendency to coalesce over time, irreversibly leading to destabilization. Water/Oil reverse emulsion drilling Muds are highly recommended when significant depths are reached. This study aimed to contribute experimentally to the knowledge of the structure (stability) and rheological behavior of drilling mud systems based on water/crude oil inverse emulsions through the investigation of the effect of organophilic clay. The chemical composition of organophilic clay such as VG69 shows a strong presence of silicon oxide (SiO₂), followed by aluminum oxide (Al₂O₃), so these two elements are considered to be the main constituents of organophilic clays. The study also shows that the SiO₂/Al₂O₃ ratio is equal to 3.52, which can be explained by the high content of free silica contained in the organophile clay used. The particle size analysis of the organophilic clays showed that the size of the particles analysed is in the range of 30 to 80 μm, this result ensures the correct particle size quality of organophilic clays and allows these powders to be used in Drilling mud systems. The experimental data of steady-state flow measurements are analyzed in the classic way by the Herschel-Bulkley model. Microscopic observation shows that the addition of quantities of organophilic clay type VG69 less than or equal to 3 g leading to the stability of the water/oil inverse emulsions, on the other hand, for quantities greater than 3 g, the emulsions are destabilized. The results obtained also showed that adding 3 g of organophilic clay to the crude oil drilling mud improves their stability by 70%.

Keywords : drilling muds, inverse emulsions, rheological behavior, yield stress, stability, organophilic clay

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