

## Abstract

The objective of this study is to investigate and develop the physical and chemical properties of water-based drilling mud mixed with 1, 3 and 5% of fly ash by weight at 30, 60 and 90°C. The 1 and 3% of fly ash containing drilling mud mixed with additives contain dolomite, rice husk ash, lime and starch at 1, 3 and 5% by weight at 30, 60 and 90°C. The methodology is to use the effect of temperature and mixing ratio on rheological properties of drilling mud on Bingham and Power Law model. The physical properties testing include the filtration, density, pH, resistivity, solid content and sand content. The testing procedures follow the API RP 13B-1. The drilling mud mixed with 1% of fly ash by weight and 1% of starch at 60 and 90°C. These formulas can be improved the water-based drilling mud. The elemental and mineral composition of drilling mud mixed with fly ash and additives not relative with temperature. However, the percentages of elements and minerals composition have changed by the mixing ratio of the chemicals, including the barite 29.8 to 43.5%, montmorillonite 14.9 to 30.6%, kaolinite 7.5 to 22.1%, quartz 5.9 to 15.7%, calcite 1.9 to 28.4%, hematite 2.0 to 4.8%, gypsum 0.6 to 5.3%, dolomite 0.2 to 0.5%, anorthite 0 to 2.1% and anhydrite 0 to 6.2%. The surface topography analysis indicates roughness, the components agglutination and stability particles, although the samples pass heating. The physical properties testing demonstrate that viscosity 40 cP, density 1.098 to 1.100 g/cm<sup>3</sup>, pH 10.2 to 10.4, filtration 9.0 to 12.0 ml and resistivity 3.87 to 4.14  $\square$ .m. In summary, the fly ash can be used to improve the rheological properties and pH of drilling mud. The cost of fly ash is cheaper than other additives, but the drilling mud mixed with fly ash must be combined with other additives that can be controlled filtration. Hence, drilling mud mixed with fly ash has a higher production cost.