

Nanomaterials-Assisted Drilling Fluids for Application in Oil Fields - Challenges and Prospects

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Abstract : The drilling fluid has a significant impact on drilling efficiency. Drilling fluids have several functions which make them most important within the drilling process, such as lubricating and cooling the drill bit, removing cuttings from down of hole, preventing formation damage, suspending drill bit cuttings, , and also removing permeable formation as a result, the flow of fluid into the formation process is delayed. In the oil and gas sector, unconventional shale reserves have been a central player in meeting world energy demands. Oil-based drilling fluids (OBM) are generally favored for drilling shale plays due to negligible chemical interactions. Nevertheless, the industry has been inspired by strict environmental regulations to design water-based drilling fluids (WBM) capable of regulating shale-water interactions to boost their efficiency. However, traditional additives are too large to plug the micro-fractures and nanopores of the shale. Recently, nanotechnology in the oil and gas industries has shown a lot of promise, especially with drilling fluids based on nanoparticles. Nanotechnology has already made a huge contribution to technical developments in the energy sector. In the drilling industry, nanotechnology can make revolutionary changes. Nanotechnology creates nanomaterials with many attractive properties that can play an important role in improving the consistency of mud cake, reducing friction, preventing differential pipe sticking, preserving the stability of the borehole, protecting reservoirs, and improving the recovery of oil and gas. The selection of suitable nanomaterials should be based on the shale formation characteristics intended for drilling. The size, concentration, and stability of the NPs are three more important considerations. The effects of the environment are highly sensitive to these materials, such as changes in ionic strength, temperature, or pH, all of which occur under downhole conditions. This review paper focused on the previous research and recent development of environmentally friendly drilling fluids according to the regulatory environment and cost challenges.

Keywords : nanotechnology, WBM, Drilling Fluid, nanofluids

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