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Performance Evaluation of Next Generation Shale Stabilizer

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Abstract : A major proportion of the formations drilled for the production of hydrocarbons consists of clay containing shales. The petroleum industry has hugely investigated the role of clay minerals and their subsequent effect on wellbore stability during the drilling and production of hydrocarbons. It has been found that when the shale formation comes in contact with water-based drilling fluid, the interaction of clay minerals like montmorillonite with infiltrated water leads to hydration of the clay minerals, which causes shale swelling. When shale swelling proceeds further, it may lead to major drilling complications like caving, pipe sticking, which invariably influences wellbore stability, wellbore diameter, the mechanical strength of shale, stress distribution in the wellbore, etc. These problems ultimately lead to an increase in nonproductive time and additional costs during drilling. Several additives are used to prevent shale instability. Among the popular additives used for shale inhibition in drilling muds, ionic liquids and nanoparticles are emerging to be the best additives. The efficiency of the proposed additives will be studied and compared with conventional clay inhibitors like KCl. The main objective is to develop a highly efficient water-based mud for mitigating shale instability and reducing fluid loss which is environmentally friendly and does not alter the formation permeability. The use of nanoparticles has been exploited to enhance the rheological and fluid loss properties in water-based drilling fluid ionic liquid have attracted significant research interest due to its unique thermal stability. It is referred to as ‘green chemical’. The preliminary experimental studies performed are promising. The application of more effective mud additives is always desirable to make the drilling process techno-economically proficient.

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