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Simulation of Ester Based Mud Performance through Drilling Genting Timur Field

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Abstract : To successfully drill oil or gas well, two main characteristics of numerous other tasks of an efficient drilling fluid are required, which are suspended and carrying cuttings from the beneath wellbore to the surface and managed between pore (formation) and hydrostatic pressure (mud pressure). Several factors like mud composition and its rheology, wellbore design, drilled cuttings characteristics and drilling string rotation contribute to drill wellbore successfully. Simulation model can support an appropriate indication on the drilling fluid performance in the real field as Genting Timur field, located in Pahang in Malaysia on 4295 m depth, held the world record in Sempah Muda 1 (Vertical). A detailed 3 dimensional CFD analysis of vertical, concentric annular two phase flow was developed to study and asses Herschel Bulkley drilling fluid. The effect of Hematite, Barite and calcium carbonates types and size of cutting rock particles on such flow is analyzed. The vertical flows are also associated with a good amount of temperature variation along the depth. This causes a good amount of change in viscosity of the fluid, which is non-Newtonian in nature. Good understanding of the nature of such flows is imperative in developing and maintaining successful vertical well systems. A detailed analysis of flow characteristics due to the drill pipe rotation is done in this work. The inner cylinder of the annulus gets different rotational speed, depending upon the operating conditions. This speed induces a good swirl on the particles and primary fluids which interpret in Ester based drilling fluid cleaning well ability, which in turn determines energy loss along the pipe. Energy loss is assessed in this work in terms of wall shear stress and pressure drop along the pipe. The flow is under an adverse pressure gradient condition, which causes chance of reversed flow and transfers the rock cuttings to the surface.

Keywords : concentric annulus, non-Newtonian, two phase, Herschel Bulkley
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