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"Gheorghe Asachi" Technical University of Iasi, Romania

COMPARATIVE STUDY OF THE RHEOLOGICAL PROPERTIES OF A DRILLING BIOFLUID COMPARED TO A PARAFFINIC FLUID

Ramon Araújo Martins, Renata Nazaré Vilas-Bôas*, Marcus Felipe Oliveira Quetez, Marisa Fernandes Mendes, Luís Americo Calçada, Claudia Miriam Scheid

Chemical Engineering Department, Federal Rural University of Rio de Janeiro, Seropédica, RJ, Brasil, CEP:23890-000

Abstract

Drilling fluid or mud plays a crucial role during rotary drilling of oil wells and its use is inevitable. The appropriate choice of fluid to be used can result in significant savings during the exploration of a well. Currently, non-aqueous fluids are superior compared to water-based fluids in terms of performance. Many of these fluids are toxic and, in most cases, based on diesel or olefin, which results in processes that are more harmful to the environment and a higher cost for treating the gravel produced. Therefore, oil-based fluids are more expensive and not recommended from an environmental point of view. Therefore, the search for more sustainable alternatives is extremely important for the total or partial replacement of these non-renewable fluids. From this perspective, the present study carried out experimental evaluations of the rheological potential of a biodiesel-based drilling fluid, originating from the transesterification of soybean oil. The construction and evaluation of the rheogram profile, as well as the rheological behavior in different shear rate ranges, were analyzed at different temperatures, including the modulus of elasticity and the modulus of viscosity. These parameters were then compared with those of a paraffin-based drilling fluid. The analyses demonstrated that the biofluid presented viscous characteristics similar to those of the synthetic fluid, presenting a more pronounced elastic behavior. Therefore, preliminary results indicated that it is possible to change synthetic fluids with biofluids without significant losses in the fluid's functions, indicating that further investigations must be carried out to evaluate the aging of the fluid, volume of filtrate, and solids present. However, the novelty of this study was to perform a detailed comparative evaluation of the rheological behavior of a biodiesel-based drilling fluid in relation to a paraffinic synthetic fluid, highlighting the influence of the chemical structure of the fluids on their viscoelastic properties.

Key words: biodiesel, oil-based drilling fluids, rheology, viscoelasticity

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* Author to whom all correspondence should be addressed: e-mail: revilasboas@ufrrj.br