## **Accepted Manuscript**

Sedimentation of solids in drilling fluids used in oil well drilling operations

Nara Brandão Costa Santos, Flávia Marques Fagundes, Fábio de Oliveira Arouca, João Jorge Ribeiro Damasceno

PII: S0920-4105(17)30983-X

DOI: 10.1016/j.petrol.2017.12.026

Reference: PETROL 4516

To appear in: Journal of Petroleum Science and Engineering

Received Date: 23 October 2017
Revised Date: 28 November 2017
Accepted Date: 11 December 2017

Please cite this article as: Santos, Nara.Brandã.Costa., Fagundes, Flá.Marques., de Oliveira Arouca, Fá., Damasceno, Joã.Jorge.Ribeiro., Sedimentation of solids in drilling fluids used in oil well drilling operations, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/i.petrol.2017.12.026.

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### Journal of Petroleum Science and Engineering 1

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- Nara Brandão Costa Santos a,\*, Flávia Marques Fagundes a, Fábio de Oliveira Arouca a, 3
- João Jorge Ribeiro Damasceno <sup>a</sup> 4
- <sup>a</sup> Federal University of Uberlândia, School of Chemical Engineering, Av. João Naves de 5
- Ávila, 2121, Bloco 1k, Santa Mônica, Uberlândia/MG, ZIP Code 38.408-100, Brazil 6
- 7 \*Corresponding author.
- 8 E-mail addresses: narabcs@hotmail.com (N.B.C. Santos), flaviamfagundes@gmail.com
- (F.M. Fagundes), arouca@ufu.br (F. de Oliveira Arouca), damasceno@ufu.br (J.J.R. 9
- 10 Damasceno).
- 11 Abstract

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- Petroleum stands out as an important energy source. In oil well drilling operations, 13
- 14 drilling fluids are used with the main purpose of cleaning and maintaining the
- hydrostatic pressure in the wellbore. Due to the importance of understanding solid-fluid 15
- interaction and the lack of quantitative studies on solids content in regions with high 16
- 17 solids concentrations, this study evaluated the stability of drilling fluids. Rheological
- tests and gravitational and batch sedimentation tests with fluids differentiated by the 18
- addition of calcium carbonate assessed the separation dynamics as a function of time 19
- 20 and position and determined the constitutive equations for pressure on solids, which are
- fundamental to solve models of flow through porous media. Gamma-ray attenuation, a 21
- non-destructive technique, quantified the local volumetric solids concentration in 22
- sedimentary regions. The results showed a shear-thinning behavior and thixotropic 23
- effects in the fluids and the influence of calcium carbonate on the sedimentation profile. 24
- The non-thickened suspension had lower values of apparent viscosity, higher 25
- sedimentation rates, and more compressible sediments than the thickened system. Thus, 26
- 27 the formulation of drilling fluids affected the separation process in suspensions; for that
- reason, it must be adjusted to the operational conditions. This study contributed to 28
- increase rheological and stability knowledge on non-Newtonian suspensions. 29

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- Keywords: drilling fluids; rheology; suspension sedimentation; gamma-ray attenuation 31 technique. 32
- 33
- Highlights: 34

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- 36 - Gamma-ray attenuation is a non-destructive technique that quantifies the volumetric 37 solids concentration.
- Drilling fluids show shear-thinning and thixotropic behavior. 38
- 39 - When added to a suspension, calcium carbonate increases its stability.
- Proposal of constitutive equations for pressure on solids. 40
- Plotting of constant concentration curves for solids. 41

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