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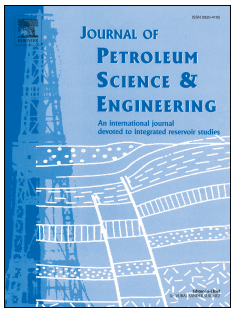

A novel and robust model for determining rheological properties of newtonian and non-newtonian fluids in a marsh funnel

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A Novel and Robust Model for Determining Rheological Properties of Newtonian and non-Newtonian Fluids in a Marsh Funnel

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Abstract

In oil and gas industry, it is required to measure rheological properties for quality control reasons by simple and robust techniques. Marsh funnel is recognized as a widely used and reliable measuring device in different engineering disciplines. The final discharge time from the Marsh is the only measured parameter during field operation. There are studies that suggest some rheological parameters such as yield point, apparent viscosity and plastic viscosity of drilling fluids can be determined using temporal variation of the height of fluids in the Marsh funnel. However, the methodologies developed show considerable deviation between the Marsh funnel results and other standard viscometer devices. Sedaghat et al. (2016) developed a new mathematical model for determining the discharge flow rate in the Marsh funnel. In the present study, a simple and robust model is introduced for determining shear stress and shear rate for Newtonian and non-Newtonian fluids in the Marsh funnel. The proposed model is based on the developed model for the flow rate and modelling energy losses in the Marsh funnel using the Bernoulli's equation. The rheological properties are accurately obtained and the results are presented and compared with other analytical methods and the standard Fann 35 viscometer measurements. For the Newtonian fluid, the standard mineral oil is used while for the non-Newtonian fluids, the measurements of eight different

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