

Experimental Investigation of Naturally Filter Cake Removal

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Abstract

In many wells, the requirement from the operator is to be able to produce the well with the minimum number of interventions and treatments, ideally by just reversing the pressure drop between the well bore and the formation. Depending on the amplitude of this pressure drop, the permeability of the reservoir rock and the nature of the drilling mud employed, it has been shown that the filter cake can fail.

This study wants to find experimentally the effects of filtration pressure, flow rate and permeability on filter cake removal. A simple model of filtration cell was designed and constructed. Different rock samples were used for investigating the permeability effect on filter cake removal. Statistical software was defined and used for modeling the experimental data to achieve a quantitative conclusion about filter cake removal and parameters effected on.

Introduction

As soon as the drilling bit comes in contact with the reservoir, there is a rapid mud invasion (spurt loss) since there is no filter cake to prevent mud solids particles to enter the pay zone. During this period, there is a progressive deposition of these particles, which creates an internal filter cake. When this internal filter cake is well established, most of the solid particles are retained outside of the formation, generally creating a thin external filter cake, which mainly controls the rate of filtrate invasion.

External filter cake formed on well bore walls during the drilling process has, among other roles, the task of protecting the formation from the invasion of damaging drilling fluid. Building up filter cakes during drilling operations has long been one of the most practical ways to minimize fluid loss to the formation. The effectiveness of the filter cake is critical especially for long open hole completions with no perforations.

The formation damage due to drilling mud can be characterized by the following factors: