Study of Cluster Efficiency in Unconventional Reservoirs by Analytical Simulators

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Abstract

Unconventional reservoirs have been defined as formations that cannot be produced at economic flow rates or that do not produce economic volumes of oil and gas without horizontal well with hydraulic fracture treatments. Horizontal well fracturing efficiency in unconventional reservoirs is the main factor for the success of developing unconventional reservoirs. The early focus of the industry was on the operational efficiency and during this period, the geometric spacing of perforation clusters adopted as the preferred completion method. Cipolla et al. (2011) presented a case study on the interpretation of production logs from hundreds of horizontal wells. The results indicated that 60% of perforation clusters contribute to production when completed geometrically and completion cost could reach more than 60% of the total well cost. Recently, numerous studies have been undertaken to understand this phenomenon. Increasing the stimulation effectiveness and maximizing the number of perforation clusters contributing to productivity was an obvious area for improvement to engineer the completion design.

The uniform initiation and distribution of fractures in each frac stage is very complex because there are many factors affecting the fracture initiation such as stress orientation, heterogeneity, existing of natural fractures, and completion design. This paper presents sensitivity studies investigating the effect of the formation permeability, fracture spacing, fracture half-length, fracture conductivity, flowing bottom hole pressure, and outer reservoir permeability on the well ultimate recovery efficiency by using analytical simulator.

Society of Petroleum Engineers 2018, August

Future University In Egypt (http://www.fue.edu.eg)

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