Determining the Effectiveness of Isolation Techniques Using Completion Diagnostics and Production Analysis

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ABSTRACT

The development of unconventional resources in North America has led to the implementation of a variety of drilling and hydraulic fracturing techniques. This article reviews completion diagnostic data from over 50 wells in the Anadarko and Williston basins that were evaluated by a multidisciplinary team. Production analyses were conducted in conjunction with the diagnostic data to further qualify the effectiveness of different completion practices.

Stimulation diagnostics including proppant tracers, microseismic data, and permanently installed fiber optic sensors are available to assist with identifying fracture growth both within and outside of a targeted interval. Wells in this study will utilize proppant tracers for the evaluation of stage coverage and isolation effectiveness.

This article specifically focuses on isolation techniques used during hydraulic fracturing of uncemented multistage horizontal wells, including swellable packers, and single and dual-element hydro-mechanical packers. Stimulation coverage and zonal containment for these isolation techniques were evaluated, and the results demonstrate how different isolation techniques can affect production.

This study shows how operating conditions may also affect the integrity of certain isolation techniques, as results for the most effective isolation techniques vary by basin. These operating variations, among others, are examined in this paper as a possible contributing factor for the loss of annular isolation and corresponding production decreases.

Isolation techniques are often implemented in drilling and completion programs with insufficient data or field trials. Most of these decisions are made based on perceived cost optimization rather than the overall completion effectiveness and performance of the well. This study is the first of its kind using a macroscopic analysis of completion diagnostics and production data over a large data set for the evaluation of isolation techniques.