Engineered Completions Approach Boosts Production From Texas Shales

The past decade has seen a major resurgence in E&P activities in the United States, driven largely by technology advances that have turned oil and gas shale plays into production powerhouses. Yet for all the progress made in areas like the Bakken, Eagle Ford and Wolfcamp plays in Texas alone, production data suggest that current stimulation and completion techniques have reached their performance limits.

Production log data for a sample of Eagle Ford wells, for example, shows that on average less than 64% of perforation clusters contribute to total well production (SPE 144326). Schlumberger and four Eagle Ford operators aimed to boost this average through a consortium that evaluated openhole logging data in horizontal wells that had the optimal positioning of fracture stages and perforation clusters.

An Integrated Solution
Schlumberger developed the Unconventional Reservoir Optimized Completion (U-ROC) workflow specifically to enable integration of reservoir, stimulation and production data. The Schlumberger Mangrove® engineered stimulation design in the Petrel platform, a hydraulic fracturing simulator that integrates seamlessly with a comprehensive seismic-to-stimulation workflow, was used to optimize completion design. The input log data for Mangrove came from the ThruBit® logging services, technology designed to efficiently deliver key quad-combo measurements—gamma ray, resistivity, neutron density and sonic—in the horizontal section.

This combined offering produced an engineered completion design strategy that boosted perforation efficiency to 82% in these wells, which equated to a 50% reduction in the number of nonperforming completion clusters. The study also allowed intervals with similar properties to be grouped into fracture stages and perforation clusters to be aligned with each stage. This work resulted in a calculated increase in net present value of $1.5 million for the first year of production.

Increasing Production in the Wolfcamp
Clayton Williams Energy, Inc. recently collaborated with Schlumberger in the liquids-rich Wolfcamp Shale play in the Permian Basin to use the engineered completion approach to boost well production based on the mechanical properties of the rock. The ThruBit logging services were used once again to acquire a full suite of wireline logs—porosity, resistivity, Poisson’s ratio and Young’s modulus—to calculate in situ stresses. The Mangrove stimulation design then used these calculated stresses to select optimal perforation intervals for the Wolfcamp wells.

Clayton Williams implemented the stimulation design for its first horizontal Wolfcamp wells, and within 90 days of production saw a 39% increase in oil production compared with the best offset well production in other horizontal wells in the field. Based on this result, the operator requested the engineered completion design afforded by the integrated ThruBit and Mangrove offering for five additional wells.

This work demonstrates the dramatic impact that an intelligent engineered completions approach can have on increasing reservoir contact and productivity for shale wells. These results are not limited to any one reservoir or play, but can be extended to any stimulation program to optimize completions and help contribute to the United States’ goal of reaching stable and sustained energy production.

*Mark of Schlumberger