UNCONVENTIONALS

CASE STUDY

RockPerm™ Clay Control Service Enhances Well Performance

FRACTURE FACE STABILIZATION CHEMICALS REDUCE FORMATION DAMAGE ON MULTI-WELL FIELD STUDY

MIDLAND BASIN, TEXAS

CHALLENGE

Producing wells with abnormally high decline rates

SOLUTION

Perform RockPerm™ clay control service and quad-cell analysis to determine customized stimulation design

RESULT

Initial production in trial wells outperformed offset wells by 118 percent

OVERVIEW

A major operator in the Permian Basin used Halliburton's RockPerm™ clay control service on a multi-well field trial in an effort to decrease the decline rates and improve overall well production. Through the RockPerm clay control service, chemicals for fracture face stabilization were identified and fluid design recommendations were generated to minimize fracture face failure. Wells treated with the RockPerm clay control service recommendations realized improved initial production rates up to 118 percent.

118%
INCREASE IN
PERFORMANCE

CHALLENGE

A major operator in the Permian Basin acquired a new property and noticed abnormally high production decline rates on four existing wells. All four vertical wells were completed in the Spraberry and Wolfcamp formations. Treatment designs for the wells were based on common practice in the area. The challenge to Halliburton was to identify the reason the wells were underperforming and to recommend new designs.

Production data, previous designs, and available log data revealed a potential unstable formation type. If not treated properly, this type of formation can experience fracture face instability, resulting in deterioration of the fracture over time and, ultimately, in reduced production. In order to know more, formation rock and fluid samples were required.

SOLUTION

As the next well was drilled, sidewall cores were obtained. Analyzing the formation proved that the theory was correct: this was an unstable formation type. Utilizing RockPerm clay control service and quad-cell testing, customized fluids were designed for the wells to minimize damage. Fracture and reservoir flow capacity damage can arise from swelling, sloughing, fines migration, and formation softening – all of which can decrease production by causing a damaged region at the

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Reduced initial decline rate seen in the original completions by 21 percent

Cost per BOE – 36 percent reduction

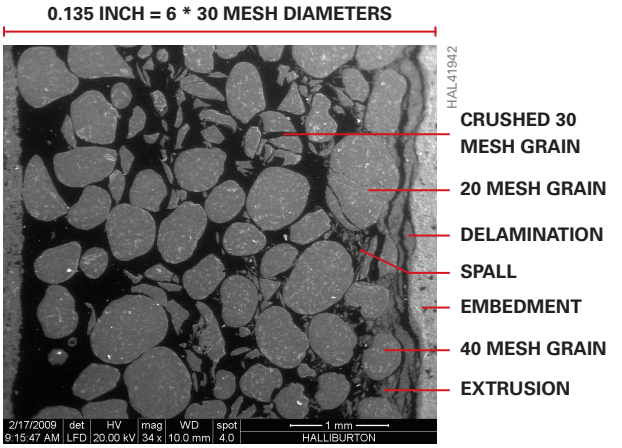

Figure 1 Quad-cell image showing fracture face damage.

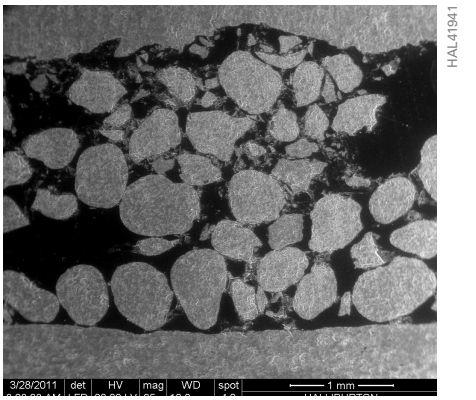

Figure 2 Quad-cell image showing fluid containing fracture face stabilization chemicals that reduce fracture face damage.

fracture-reservoir interface. Treatment fluid contacting and leaking into the reservoir fracture face should have optimized chemistry to control these effects and to help preserve inflow capacity at the interface. Using the cores obtained, RockPerm clay control testing was performed. The testing protocol includes a swelling stability test (SST) to measure the swellability of the formation material, and a newly developed mechanical stability test (MST) that can be correlated to hardness changes of the sample.

Quad-cell testing was also performed to better understand the mechanism of fracture face failure. Utilizing a quad-cell press, formation wafers and slurried proppant are tested under closure stress to be examined for evidence of proppant embedment and crushing.

This testing, combined with the RockPerm analysis, was used to determine the top-performing products from the Halliburton suite of unconventionals-focused clay control technologies. The results from the quad-cell testing also indicated that running higher concentrations of higher-strength proppants in the treatment would result in better well performance. This allowed for further customization of the stimulation treatment. Figure 2 shows the same quad-cell tested with the recommended fluid and proppant design.

RESULT

The four wells treated based on the RockPerm and quad-cell testing analysis performed significantly better than four offset wells treated with comparable but non-customized treatments. Initial production rates improved by up to 118 percent. The initial decline rate was decreased as compared to the offsets by up to 21 percent. These improved production rates were sustained over time (Figure 3). A final added benefit: cost per barrel of oil equivalent (BOE) was decreased by 36 percent. All in all, a huge win for the operator.

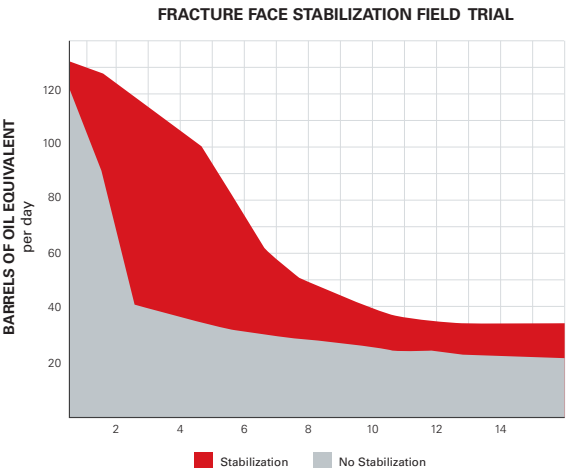

Figure 3 Production data showing improved production with stabilization chemicals.

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