MicroScout™ Service Enhances Well Production in Woodford Shale Play

SERVICE IMPROVES PRODUCTION RATES BY 10–15 PERCENT

WOODFORD SHALE PLAY, ANADARKO BASIN

OVERVIEW

An operator in the Woodford shale play of the Anadarko Basin wanted to improve the stimulated reservoir volume in its wells to improve long-term production. The stimulation designs traditionally used were offering significant stimulation of the primary fractures, but were not sufficiently stimulating the secondary fractures. Adding to the challenge, the reservoir typically exhibited pressure dependent leakoff (PDL), resulting in high-stimulation treating pressures and a high risk of screenouts. As a solution to both, Halliburton introduced MicroScout™ service, which increased the stimulated reservoir volume and decreased the negative effects of the PDL, resulting in wells that produced up to 15 percent more as compared to offset wells.

CHALLENGES

When stimulating and producing from the Woodford shale play, there are two issues that are consistently encountered: high treating pressures and steep production declines. High treating pressure can result from the significant degree of fracture complexity associated with the formation. While this complexity can be a benefit to production, it can also be a source of fracture entry friction. The entry friction encountered in the Woodford shale play can range from moderate to severe, and can be characterized by PDL to the secondary fracture network present in the formation. The PDL results in excessively high treating pressures, which limits the achievable treatment rate during stimulation. This can impact treatment efficiency due to a reduced treatment rate or premature screenout.

When wells in the Woodford play are put on production, they often have steep production declines. A potential contributor to the decline is the effect of the secondary fracture network present in the formation (both in situ and generated during stimulations) not being effectively propped open and, consequently, not contributing to production throughout the life of the well. The fractures of the secondary network often have fracture widths that are smaller than the dominant hydraulic fractures, making it very difficult for even smaller proppants to enter the fracture network and prop open the fractures.

SOLUTION

» Utilize MicroScout™ service in the initial pad stages of stimulation treatments to mitigate entry friction issues
» MicroScout service was recommended because it provides a propping agent that is small enough to enter and prop open secondary fractures during production, which helps improve production rate

RESULTS

» MicroScout service reduced entry friction during stimulation treatments
» Over 150+ days of production, wells treated with MicroScout service improved by 10–15 percent as compared to offset wells
» Use of MicroScout service resulted in wells having a 15–30 percent uplift in estimated ultimate recovery (EUR)
Wells treated with MicroScout™ service have shown a 10–15 percent uplift in current production vs. offset wells.

**SOLUTION**

MicroScout™ service overcame the two challenges encountered here. The MicroScout propping agent is pumped during the pad stages. It decreases the high PDL and the risk of screenout. The MicroScout propping agent enters the secondary fracture network and reduces the fluid leakoff into the network. As a result, treating pressures and the negative effects of PDL are reduced. This minimizes the possibility of a screenout during a treatment. Reducing this risk and improving operational reliability helps improve overall efficiencies, which can save money.

Second, the service provides conductivity for secondary fractures too small to be propped open by conventional proppants. The MicroScout micro-proppant particles are smaller than conventional proppants, so they are capable of entering and propping open secondary fractures, thus increasing the stimulated reservoir volume and ultimately increasing production.

To evaluate the effectiveness of MicroScout service in the SCOOP area of the Woodford shale play, a 12-well field trial was proposed. The field trial consisted of three separate pad locations, with MicroScout service being utilized on one well in each location.

*Figure 1. Production of wells treated with MicroScout™ service vs. offset production, showing normalized cumulative production (in barrels of oil equivalent, or BOE) of the wells treated with MicroScout service and of the offset wells that utilized a similar job size. The wells treated with MicroScout service demonstrated a 10–15 percent uplift in production.*
RESULTS

Each pad location consisted of six wells, four wells, and two wells, respectively. The treatments consisted of a standard design; a design that incorporated the MicroScout™ service; and, on two pad locations, a higher-water-volume design, and a treatment design with 40 percent more proppant. When comparing the production from the wells treated with MicroScout service to wells treated with the traditional design, those treated with MicroScout service showed a 10–15 percent uplift in production. Additionally, the wells treated with MicroScout service proved to have shallower decline rates even when compared against wells where 40 percent more proppant was pumped. The estimated ultimate recovery (EUR) on the wells treated with MicroScout service was approximately 15–30 percent higher than the offset wells. Not only were production benefits realized, but the utilization of the MicroScout service during stimulation treatments also consistently reduced entry friction caused by PDL, leading to lower treating pressures of 500–1,000 psi, which, in turn, has led to more consistency in treatment rate achievement and to more-efficient treatment placement.

Figure 2. Daily production rate (BOE/day) vs. time (days). This production plot from Pad B demonstrates the shallower production declines observed on the wells treated with MicroScout™ service as opposed to a well where 40 percent more proppant was pumped.