Production Doubled in a Saudi Aramco Carbonate Reservoir

Case study: StageFRAC system improves productivity from long openhole horizontal oil well in Saudi Arabia

Challenge
Improved production contribution from low-permeability openhole sections in a carbonate reservoir.

Solution
Used StageFRAC*† multistage fracturing and completion services for uniform stimulation.

Results
Doubled production and tripled PI in the treated well as compared to the offset well.

A horizontal underachiever
A Saudi Aramco well in a carbonate reservoir was completed with 5,000 ft of 61⁄8-in horizontal open hole. Eight different zones were open for production, but most oil contribution was expected to come from the higher-permeability Zone 1. Because of the trajectory and length of the openhole horizontal section, coiled tubing (CT) could not reach the lower zones. The CT was run as deep as possible, and the acid treatment was bullheaded into the horizontal section. Because of higher-permeability rock at the heel, all the acid treatment went into Zone 1, and the other seven zones were not effectively stimulated. After this treatment, productivity improved; however, the increase was attributed to the high-permeability zone because it took most of the acid treatment.

Combined mechanical and chemical solution
Saudi Aramco selected StageFRAC services for a staged acid fracturing of the unstimulated zones in the candidate well. These services enable multiple fracturing of an uncemented completion in one pumping treatment.

StageFRAC services were used to successfully stimulate seven production zones in a horizontal carbonate reservoir well in Saudi Arabia.
Case study: StageFRAC system improves productivity from long openhole horizontal oil well in Saudi Arabia

Openhole packers are run on conventional casing to segment the reservoir and maximize reservoir drainage through selective stimulation and individual isolation of each zone. Between each set of openhole packers are hydraulically activated sliding sleeves. During pumping, balls are dropped from surface to shift each sliding sleeve open and isolate previously fractured sliding sleeves.

Schlumberger and Saudi Aramco engineers collaborated to design an eight-stage StageFRAC treatment in which the lower seven zones would receive individual acid treatments pumped in multiple alternating stages consisting of a pad followed by acid. After each stage, the treatment was flushed with friction-reduced water. The StageFRAC system would also cover the upper zone (Zone 1), but this zone would not be opened until after the well was stimulated and tested.

**Production boost**

The StageFRAC service enabled individual stimulation treatments of Zones 2 through 8 in one pumping operation. It also allowed flowback of these zones immediately following the treatment.

Zones 2 through 8 of the well treated with the StageFRAC service were tested and evaluated with the most prolific zone (Zone 1) isolated. The results were compared to the offset well, which was stimulated using CT and tested with all zones open. The well treated with the StageFRAC service doubled production and tripled PI compared to the offset well. Currently, the well is being conditioned at surface for an extended test evaluation.

**About the Contact family**

StageFRAC technology is part of the permanent category of the Contact® four-category portfolio of staged fracturing and completion services. These technologies maximize reservoir contact by offering the most efficient and effective services for each well. The Contact permanent category enables fracturing and isolation of multiple stages in one pumping operation using equipment installed with the completion. Contact services can be enhanced with real-time measurement options.

The well treated with StageFRAC services doubled its total oil production.

Post-treatment testing and initial evaluation indicated that the well doubled its production. In addition, PI was measured at triple the previous rate.

The well treated with StageFRAC services doubled its total oil production.