

ACTive Services and Discovery MLT System Increase Injectivity 17,000 bbl/d in Complex Multilateral

Real-time formation damage evaluation techniques enhance stimulation design

CHALLENGE

Access and stimulate carbonate formation in an openhole environment with a high risk of sticking.

SOLUTION

Use Discovery MLT* multilateral reentry system and ACTive* family of live downhole coiled tubing services to optimize operating time.

RESULTS

Accessed, stimulated, and evaluated each of the five laterals in real time; increased the total well's injectivity from 3,000 to 20,000 bbl/d.

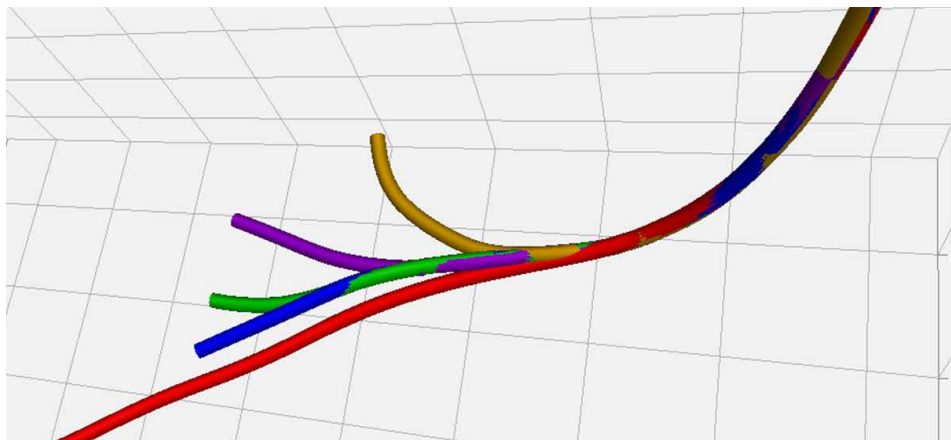


Complex shape of well poses challenge during workover operations

A five-lateral water injector well located in Saudi Arabia faced challenges during workover operations because of the complexity in the shape of the well. The well was completed in a fork-shape style with similar measured depths for each lateral which made depth correlation challenging and access difficult due to conditions at the window. The operator needed to access and stimulate the carbonate formation in an openhole environment that faced a high risk of sticking. To enhance the injectivity of the well, a new technique was proposed by the Schlumberger team.

Real-time evaluation and testing overcome challenges of complex well

The Discovery MLT multilateral reentry system and ACTive family of live downhole coiled tubing services were proposed to access, evaluate, stimulate, and test each lateral in real time. Schlumberger was engaged during the design phase to optimize operation time and maximize technical outputs from ACTive services' tools.



Each of the five laterals were accessed, evaluated, and stimulated with the Discovery MLT system and ACTive services.

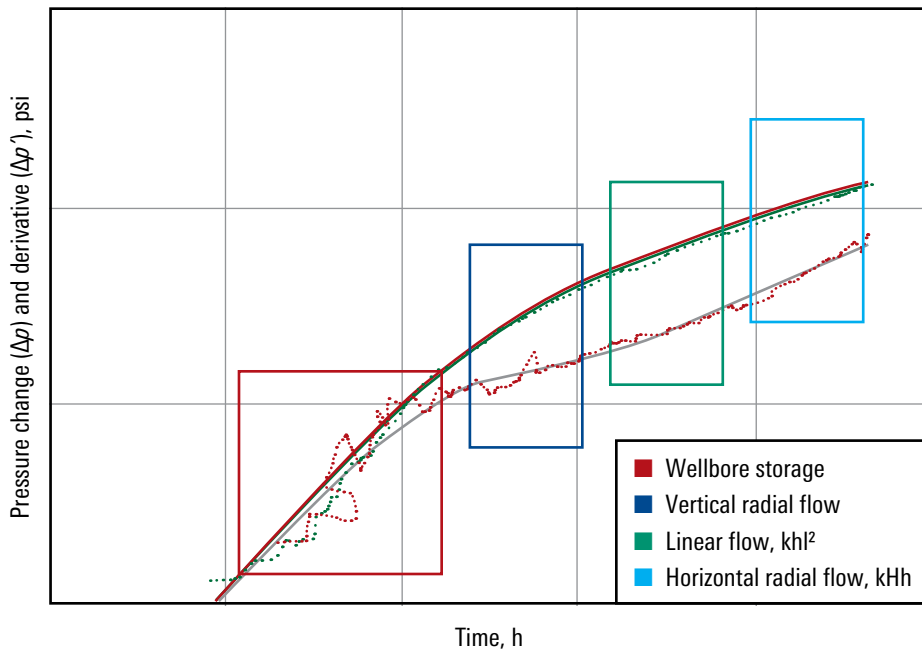
The proposed stimulation program included the following:

- Evaluate the overall performance of the well before and after the treatment with an injectivity and pressure transient test at the junction point.
- Access each lateral by deploying the Discovery MLT system.
- Correlate and verify treated lateral with ACTive GR* live CT gamma ray logging tool.
- Determine high and low intake zones using distributed temperature sensing to optimize the pumping schedule in real time.

Injectivity of well increased with efficient stimulation program

The operator collaborated with Schlumberger to successfully complete the job in a high-risk sticking environment. The real-time techniques reduced uncertainty related to the actual treated lateral, enhanced the stimulation design treatment, reduced the volume of the treatment fluid, and saved the customer additional costs and effort to restimulate. The improved injectivity rate of the well at the same wellhead pressure increased from 3,000 to 22,000 bbl/d.

The operator confirmed an increase in the injectivity of the well after treating the well in an efficient operation which reduced the sticking risk and maximized resource use. The data acquired in real time played a key role in optimizing subsequent stimulation operations. Due to real-time emulation of formation damage, the operator saved more than 20% of conventional volume of treatment fluids (acid and diverter). The operator was satisfied with the results of the operation and the same technique was approved for additional producer and injector wells.



A pressure transient test during water injection evaluated overall well performance.