

Combined Technologies Cut Stimulation Time by 50%

ACTive PTC tool and Discovery MLT system enable operator to access more reservoir, increasing stimulation efficiency and unlocking barriers in multilateral wells

CHALLENGE

Enable real-time intervention monitoring during matrix stimulation treatments, which have historically been limited to 2 bbl/min in power water injector wells.

SOLUTION

Deploy Discovery MLT* multilateral reentry system, 3¼-in ACTive PTC* live CT pressure, temperature, and casing collar locator tool for real-time downhole measurements, and a rugged version of a fiber-optic carrier, which enables pumping rates up to 8 bbl/min — all while monitoring the stimulation using real-time measurements.

RESULTS

Reduced pumping time by more than 50% per lateral, which resulted in cost savings for the operator, and verified access using gamma ray to each lateral with real-time depth correlation.



Evolution of CT intervention in multilateral wells

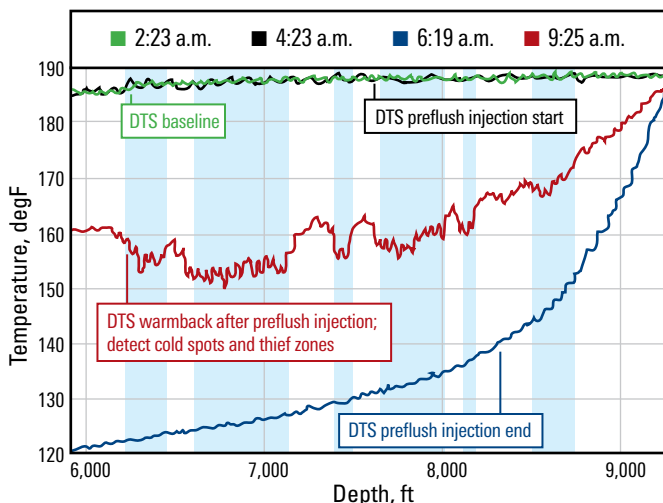
An operator in Saudi Arabia needed to perform matrix stimulation treatments in multilateral power water injector wells while monitoring the operation with real-time measurements. Historically, matrix stimulation treatments had been limited to 2 bbl/min, because they require a higher volume of fluid to be pumped, which ultimately impacts operational time during long stimulation treatments.

Matrix stimulation campaign in Saudi Arabia

Schlumberger proposed the deployment of the Discovery MLT system for lateral access, ACTive PTC tool to provide real-time downhole measurements, and a rugged version of the fiber-optic carrier, which enables pumping rates up to 8 bbl/min.

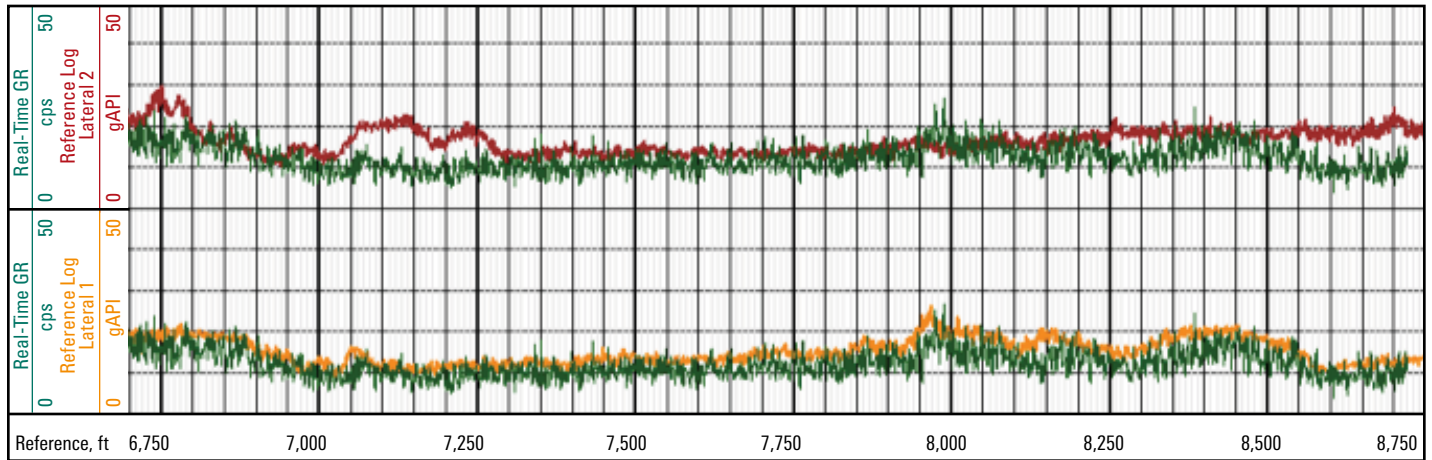
Initially, the ability to monitor downhole data in real-time, such as bottomhole pressure and temperature, enabled more efficient operation of the Discovery MLT system, as well as an optimized, proper placement of the stimulation treatment fluids by avoiding the identified high-intake zones across each lateral while using fiber optics for distributed temperature sensing (DTS).

The ACTive PTC tool provided real-time downhole measurements, which enabled quick identification of each lateral and accurate depth correlation for pinpointed acid stimulation. When the ACTive PTC tool was deployed, pumping rates were limited to a maximum of 2 bbl/min because of the downhole tools' limitations and fiber optics installed inside the CT. In some cases, this barrier represented a drawback including less fluid penetration and inefficient diversion across the zone of interests for the stimulation treatment.



DTS enabled identification of major fluid intake zones (in blue) to optimize chemical diversion placement during stimulation.

CASE STUDY: Combined technologies reduce stimulation time by 50%, unlocking barriers in multilateral well



Gamma ray measurements were used to profile each lateral, allowing prompt identification of CT access for the stimulation treatment. A good match of real-time GR (shown in green) with the reference log lateral 1 (shown in orange) provided confidence of lateral accessibility.

The ACTIVE PTC tool was successfully deployed in three dual-lateral power water injector wells for matrix stimulation treatments in openhole carbonate reservoirs. An average pump rate of 4.0 to 4.5 bbl/min was achieved during the treatments, while pumping up to 2,500 bbl/d of stimulation fluids per lateral, including VDA* viscoelastic diverting acid, 20% hydrogen chloride (HCl), and mutual solvent, while keeping all the downhole readings intact. The pump rate limitations for the standard ACTIVE PTC tool were exceeded by far, which represented a significant increase in operational efficiency.

Stimulation campaign cuts pumping time by more than 50%

The implementation of the improved high-rate ACTIVE PTC tool in conjunction with the ruggedized version of the fiber carrier and Discovery MLT system reduced pumping time by more than 50% per lateral, which resulted in a cost reduction for the operator and provided real-time depth correlation, verifying access via gamma ray to each lateral without the need to tag total depth.

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