FLUX Tesla AICD enables highest reservoir treatment injection rate and reduces well water production

Saudi Arabia, Middle East

In a Middle Eastern onshore carbonate reservoir, typical horizontal oil producer wells are drilled as 6-1/8" open holes with approximately 3,000 ft of reservoir contact. These heterogeneous reservoirs have low matrix permeability, with natural fractures playing a significant role in production.

Production logging revealed that large sections of the open hole were not contributing to production and required stimulation to increase effectiveness. At the same time, Flow Control Devices (FCDs) are essential for regulating fluid influx and delaying water breakthrough. In offset wells, production performance typically declines steadily and drops sharply after water breaks through high-conductivity fractures.

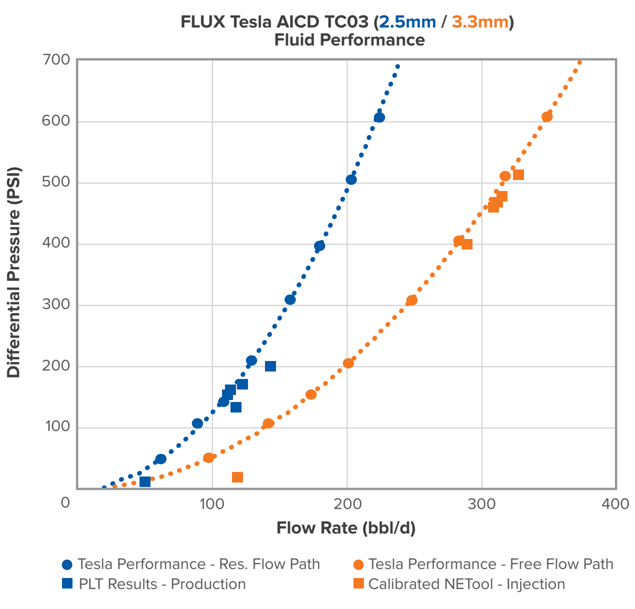
However, traditional FCD-based completions significantly limit downhole injection rates—posing a challenge for effective reservoir stimulation.

CHALLENGE

The well workover and recompletion were designed to meet several objectives:

- Segment the reservoir into multiple compartments, isolating zones with high water saturation or lost circulation.
- Control fluid influx to avoid early water breakthrough from highly fractured zones.
- Enable high-rate acid stimulation to boost productivity in tight, low-contribution intervals.

Achieving all three objectives with conventional downhole completion tools was technically challenging due to injection rate limitations.

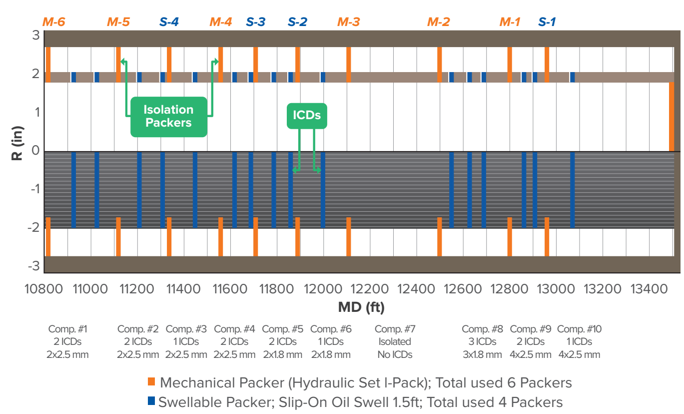


SOLUTION

Formation characteristics were evaluated using well logs and reservoir data to guide the completion design. A new-generation FLUX Tesla AICD lower completion system was selected to deliver both controlled inflow and high-rate acid stimulation, particularly targeting non-contributing compartments.

The open hole section was segmented into ten compartments using a combination of mechanical and swellable packers. Nine compartments were equipped with variable-cassette FLUX Tesla AICDs and one section was blanked off. Cassette sizes were selected based on equivalent nozzle size calculations to fine-tune flow distribution.

Fiber Optic Enabled Coiled Tubing (FOECT) was used to perform the acid stimulation. Distributed Temperature Sensing (DTS) captured temperature profiles pre- and post-stimulation to assess fluid distribution. Upon production, PLT and acoustic logging verified stimulation impact, compartment inflow profiles, and packer integrity.



RESULTS

The FLUX Tesla AICD completion enabled acid stimulation injection at a rate of 6 bpm while simultaneously acting as a mechanical diverter, evenly distributing acid along the wellbore without the need for chemical diverters. DTS analysis revealed distinctive injection profiles compared to the baseline temperature data, with smoother gradients across the targeted reservoir sections—providing confidence that stimulation fluid reached previously non-productive zones.

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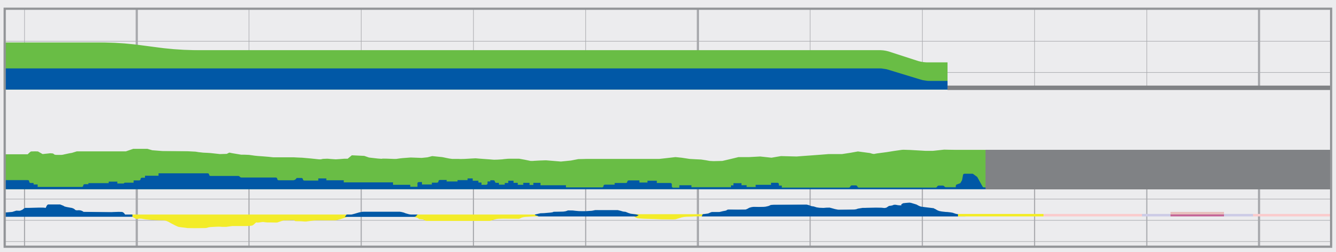
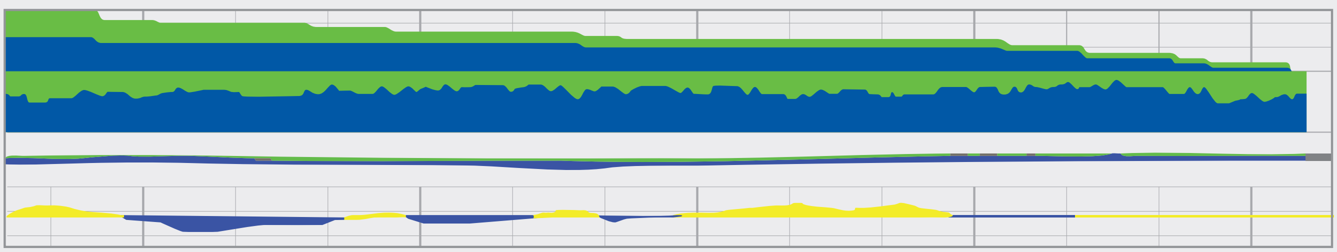
RESULTS

Following stimulation, oil production increased, particularly from areas that had not contributed prior to treatment. PLT analysis indicated a significant improvement in inflow distribution across the wellbore, supported by near-wellbore modeling. Acoustic logs also confirmed the integrity of the packers, which played a key role in ensuring effective compartmentalization during stimulation.

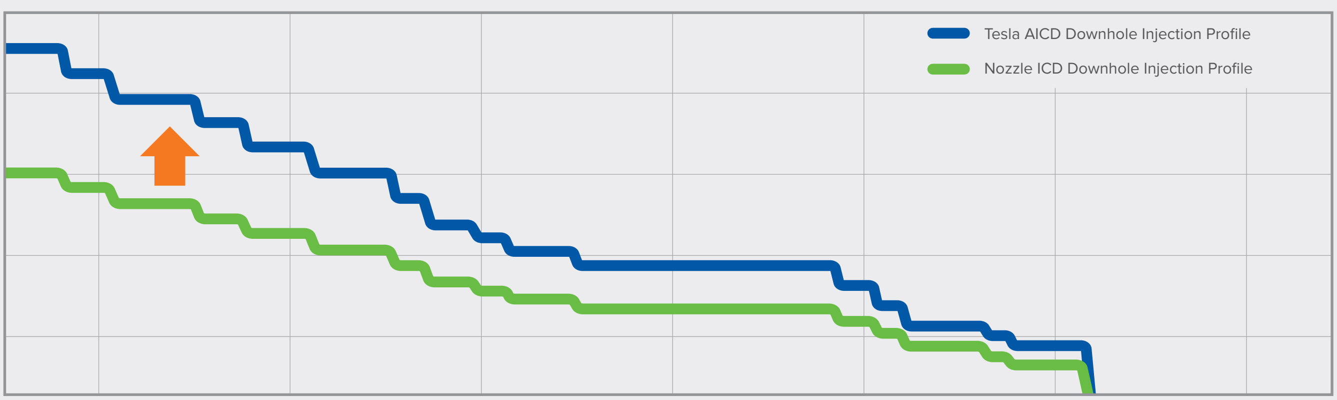
Overall, the FLUX Tesla AICD demonstrated a compelling performance, enabling more than a 55% increase in injection rates compared to equivalent nozzle-based ICDs. This enhancement in injection capability maximized stimulation effectiveness and significantly improved overall well productivity.



Pre-Stimulation PLT



Post-Stimulation PLT



Tesla AICD provides ~55% more injection rate at same injection conditions

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