DeclineShift Solution Delivered 35% Higher Production Rates By Reducing Formation Damage During Completion
Location: Ecuador

An operator was conducting an infill drilling campaign in efforts to recover bypassed oil from a mature field in Ecuador. In the initial wells, the operator performed the perforating operation, then used high-density kill-weight fluids for well control while the completion equipment, including the electrical submersible pump (ESP) system, was installed. However, production testing quickly indicated that productivity of the completions was reduced as a result of formation damage caused by the kill-weight fluids. The operator reached out to Baker Hughes for a better method for new infill well completions.

Baker Hughes offered a tailored DeclineShift bypassed oil solution that combined running underbalanced tubing-conveyed perforating (TCP) and the ESP system in a single operation. The perforating guns and bottom gun anchor were deployed using wireline, correlated and set on depth, and the ESP and completion were installed. The ESP, featuring a 400 Series multi-stage pump with a Stabilized Severe Duty (SSD) construction pump was then activated to bring the well to an underbalanced state. Using the pre-programmed seven-hour hydraulic time delay (HTD), the Model HTD-Mark II firing head was activated, and the TCP charges were detonated. As expected, underbalanced perforating increased formation productivity by preventing perforation damage to the formation.

Expected vs. Actual Well Performance

Results
- Exceeded client production expectations by 35%
- Virtually eliminated water production
- Improved formation connectivity and production potential
- Eliminated 10 days of rig time through single-trip operation

Challenges
- Infill drilling campaign to access more oil from mature field
- Standard completions design called for perforating, then “killing,” the well with high-weight fluids prior to ESP installation, causing formation damage and significantly reducing well productivity

Baker Hughes solution
- Delivered DeclineShift bypassed oil solution, running a TCP system and ESP in one trip
- Leveraged the ESP to create underbalance in the wellbore prior to perforating
- Reduced perforating shock impact on the ESP with a patented Model J Bottom Gun Anchor system

Initial production in the first well was 1,158 BOPD vs. an expected 480 BOPD, and 3,074 BOPD vs. an expected 1,000 BOPD in the second well. Once stabilized, oil production resulted in a 35% increase over expectations.
A Model J Bottom Gun Anchor™ system was used for the perforation operation because it reduces gun shock potential on the ESP completion. It automatically releases to bottom after firing, leaving full access to the perforated interval. Predator ZX™ high-performance shaped charges were used to achieve maximum formation connectivity, providing superior well-to-formation communication by extending the perforation tunnel past the near-wellbore damage into the unaltered reservoir.

After the completion was efficiently deployed using this one-trip method, initial production in the first well was 1,158 BOPD vs. an expected 480 BOPD, and 3,074 BOPD vs. an expected 1,000 BOPD in the second well. After monitoring the production for three months, results showed stabilized oil production to be 35% higher than original targets. Equally important, water production in the first two wells was virtually eliminated, drastically reducing produced water handling costs.

Carefully choosing the right combination of technologies eliminated the need for damaging well control fluids, resulting in zero to minimum formation damage. The one-trip method eliminated high hydrostatic pressures, which reduced basic sediments and water production. This minimally disruptive solution also cut 10 days off rig time for the first two wells, resulting in significant cost savings.

The client was so pleased with the results that it implemented the same Baker Hughes DeclineShift solution in an additional 13 wells to help recover more bypassed oil and improve ultimate recovery from the aging field.

This case history is presented for illustration purposes only, as results may vary between applications.