



MATURE FIELDS



UNCONVENTIONALS

Halliburton Successfully Installs Dual Completions in Ecuador

CROSS-TEAM SOLUTION GENERATES USD 18.9 MILLION IN REVENUE FOR OPERATOR IN OVER 554 DAYS

ECUADOR

CHALLENGES

- » Produce in two different zones under extreme conditions
- » Overcome competitor's failed installations
- » Run completions on a directional well under severe dogleg and reduced drift

SOLUTIONS

- » Mixed-flow modular AR pumps
- » High-efficiency motors
- » High-efficiency gas separator and gas handler
- » Telescopic joint
- » Wireline-set Versa-Trieve® packer
- » Joint installation, seal test, and startup procedure

RESULTS

- » Achieved successful completion and well startup
- » Improved run life for simultaneous run
- » Increased production, generating USD 18.9 million in additional revenue

OVERVIEW

An operator in Ecuador was constrained by local regulations to produce commingled multiple zones in a single well. Past failed installations on directional wells with severe doglegs and reduced drift demanded a different approach. Halliburton Artificial Lift and Halliburton Completion Tools collaborated to design a unique technology that resulted in a successful installation with two electric submersible pumps (ESPs) running simultaneously for over 554 days with an average production increase of 648 barrels per day (BPD).

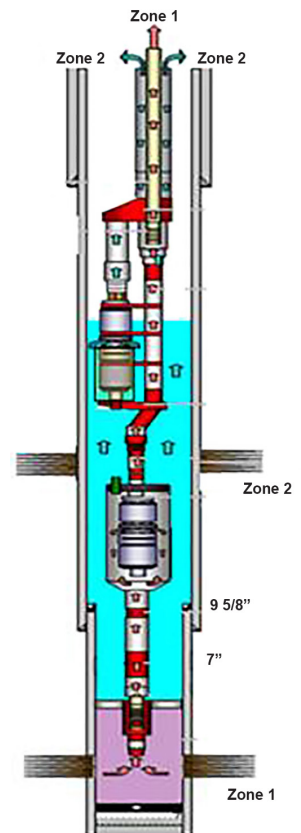
INSTALLING AND RUNNING DUAL COMPLETIONS ON DIRECTIONAL WELL

The first challenge was to install two ESPs in a deviated well with inclinations of 20°, and doglegs of 2.21°/100 feet (30 meters), using a 9-5/8-inch casing with a drift inside diameter (ID) of 8.54 in. (216.92 mm), at a setting depth of 9,820 feet (2,993 meters). The second challenge was to run the two ESPs simultaneously for a long period of time under corrosive conditions with scale and high contents of sand and free gas.

COLLABORATING TO PROVIDE A TAILORED SOLUTION

To achieve proper installation, Halliburton assigned a team that included experts from Artificial Lift and Completion Tools.

The ESPs were selected to conform with the completion tools. The pumps were designed with a mixed-flow configuration for higher gas and sand handling capability, and with abrasion-resistant (AR) modules in floating construction for an extended pumping range. The motors selected were the high-efficiency type to allow for a reduced string length to avoid unnecessary mechanical stress, along with a high-efficiency gas separator on the upper completion and a gas handler pump for the lower one, to address an increasing gas/oil ratio (GOR) due to fast reservoir depletion. Additionally, several injection points for chemical treatment were strategically set to protect against scale in the whole system.



CASE STUDY

During this run, the operator achieved an average increase in production of 684 BPD, thus generating additional revenue of USD 18.9 million.

The completion included bypass clamps fitted to mechanically protect the motor lead extension (MLE). Previously, the bypass tubing and the y-tool were tested with the MLE in the base. On the upper completion, a telescopic joint was used to ease the installation process and prevent additional stress on the ESP. An auto-aligning mule shoe was used to avoid weight on the completion and to prevent bending the pump, while a polished wireline retrievable packer (set-Versa-Trieve® packer) ensured proper sealing and higher reliability. Finally, the upper equipment was encapsulated with a shroud to increase speed of flow and ensure heat dissipation.

During the installation, the Artificial Lift and Completion Tools teams collaborated to verify casing integrity through dummy runs, and the conditioning of line hangers through calibration and cleaning. Blast joint applications against the upper sand face were used to protect against erosion, and pressure integrity tests were performed on all completion seals. Finally, proper spacing and setting of the completion were performed to avoid any undesired compression or bending of the upper ESP.

INCREASING PRODUCTION AND REVENUE WITH DUAL COMPLETIONS

Proper equipment design and collaboration between Artificial Lift and Completion Tools resulted in the successful installation and startup of the two ESPs – ultimately achieving 554 days of run life for the two units running simultaneously and over 1,062 days of run life for the lower completion. During this run, the operator achieved an average increase in production of 684 BPD, thus generating additional revenue of USD 18.9 million.



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