

PRIME Technology enables record breaking e-line deployed BaSO₄ scale milling cleanout operation

A North Sea customer had a deviated well which was shut in due a failed inflow test on the upper Gas Lift Valve (GLV). The well, completed with 5-1/2" tubing, was known to have Barium Sulfate (BaSO₄) scale build up over much of its length, this confirmed by an XY-Caliper log run in previous years. The log indicated scale deposits starting from the tubing head and causing ID restrictions of less than 4-1/2" from ~1580m, with considerable scale build up below the upper Side Pocket Mandrel (SPM) at ~2130m increasing the ID restrictions to less than 4".

Furthermore, a 2-7/8" OD toolstring run the previous year was held up at 2488m, indicating that the severity of scale deposits increased with depth. An intervention was required to remove the scale deposits down to the upper SPM to enable deployment of a Stroker and Kickover tool to carry out the GLV change out, hence reinstating the integrity of the well.

An additional requirement was to mill two joints below the SPM to enable contingency plug setting, but the customer elected to mill further, to ~3600m, to test the efficiency of the **PRIME Platform** for high volume e-line deployed scale milling and to clear the tubing for improved production rates and subsequent P&A scope access.

Solution

We recommended the new **PRIME Technology platform** combined with the **PrecisionDebris Mill** to remove the extensive amount scale expected within the tubing and enable access for the subsequent Stroker/Kickover toolstring. The high level of instrumentation offered by the **PowerTrac PRIME Tractor** and the **PRIME Direct Drive Rotation (DDR)** device coupled with the platform's full system capabilities would provide real-time visibility and control of the key milling parameters, stuck prevention from continual rotation of the bit during pick-up cycles and ensure efficiencies from minimal stall out and stall recovery.

In addition, the **PrecisionStroker** was added to the toolstring, to be available for immediate in-situ pulling capability in the case of the toolstring becoming stuck during the milling. There would be no debris collection done during this operation, instead the dislodged scale would be produced from the well between milling runs. The customer also elected to run the **Blue Spark WASP®** high power hydraulic pressure pulse tool to clear scale debris from within the SPM and maximize access to the GLV fish neck.

Challenges

- Customer had a deviated well which was shut in due a failed inflow test on the upper Gas Lift Valve (GLV)
- Well was known to have Barium Sulfate (BaSO₄) scale build up over much of its length
- Scale deposits started from the tubing head and caused ID restrictions of less than 4-1/2" from ~1580m
- Considerable scale build up below the upper Side Pocket Mandrel (SPM) at ~2130m increasing the ID restrictions to less than 4"
- Severity of scale deposits increased with depth
- Intervention was required to remove the scale deposits down to the upper SPM to enable deployment of a Stroker and Kickover tool to carry out the GLV change out

Results

- Operation successfully cleared scale from 2013m of tubing, with a total mill working time while at depth (excluding flow back and RIH/POOH time) of 45 hours, hence achieving an average ROP of 44m/hour
- Final e-line runs were then carried out using the PrecisionStroker and Kickover Tool to remove and replace the GLV

Results

An initial run was made using the wellbore cleanout toolstring, milling scale from 1580m to 2165m – approximately 30m below the upper SPM. The WASP® tool was then run, without any hold up issues, and activated as planned at the SPM depth. Following this, 5 more milling runs were done, milling scale all the way down to 3593m.

Each independent e-line run milled in the order of 300m of scale, during which the well was kept on a low injection pump rate to clear the dislodged scale from the vicinity of the milling BHA. The well was produced between runs to remove the debris from the well, during which the toolstring was pulled out of hole, rigged down and checked.

In total, the operation successfully cleared scale from 2013m of tubing, with a total mill working time while at depth (excluding flow back and RIH/POOH time) of 45 hours, hence achieving an average ROP of 44m/hour.

The inherent efficiencies of the light e-line equipment footprint and personnel requirements coupled with the fast rig up/run in hole/pull out of hole times all added to the benefits and value of this record breaking e-line scale milling operation.

Final e-line runs were then carried out using the PrecisionStroker and Kickover Tool to remove and replace the GLV. With that done, the integrity of the well was restored.

Key milling parameters monitored during the operation

