

Workstring Orientation Tool Reduces Cost and HSE Risk of More Than 130 Multilateral Operational Runs

REAL-TIME COMPLETION ORIENTATION USING THE WORKSTRING ORIENTATION TOOL MAINTAINS THROUGH-BORE ACCESS AND MINIMIZES RIG FLOOR HANDLING

NORTH SEA, NORWAY

CHALLENGES

Orienting and landing multilateral milling and completion assemblies while maintaining through-bore access for liner hanger and anchor setting operations

SOLUTIONS

Develop and deploy the WOT, a retrievable service tool based on the COT that uses the wall-mounted telemetry system

RESULTS

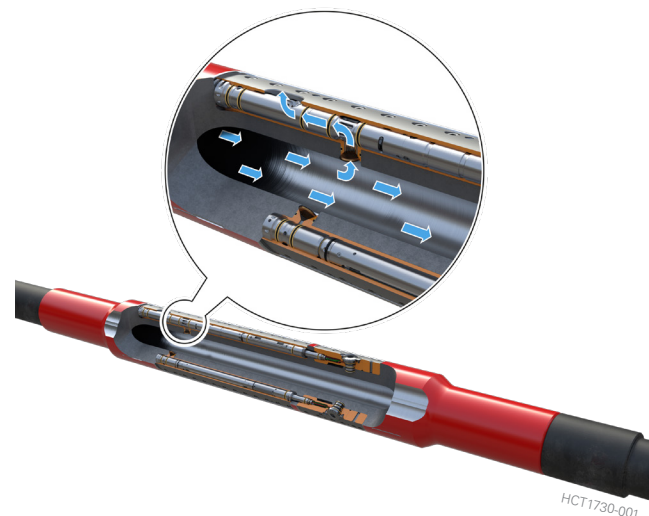
- » Orientation verification of multilateral systems, including milling whipstocks and completion deflectors
- » Orientation control while landing the FlexRite® multilateral junctions
- » Pressure rating enables multilateral junction conveyance on the VersaFlex® liner hanger system and orientation of the XTREMEGRIP® MLT anchor system
- » More than 130 successful runs within the North Sea

OVERVIEW

Since 2001, Halliburton has installed more than 400 FlexRite® Level 5 multilateral completion systems in the Norwegian North Sea. Initially, pre-milled windows were deployed using traditional measurement-while-drilling (MWD) tools in combination with an inner string and key sub. However, in 2013, the Casing Orientation Tool (COT) was developed to simplify the orientation operation by using wall-mounted telemetry into the casing string to control orientation at depth. The results included significant time savings by eliminating the inner string makeup and breakout and the COT becoming the standard method of deploying pre-milled windows within the sector.

Despite the COT's success, multilateral junction completion activities still required traditional MWD tools supplied by the directional drilling vendor, resulting in additional communication lines during job planning. Furthermore, online inner string makeup and high-side offset confirmation increased overall wellbore construction time and posed additional health, safety, and environment (HSE) risks by requiring personnel in the red zone. In response, and building on the COT's success, the Workstring Orientation Tool (WOT) was developed.

Since its initial field trial, the Workstring Orientation Tool has been deployed successfully 50 times within the Norwegian North Sea.



CHALLENGE

Using traditional MWD equipment for multilateral completions requires some compromise. While running the junction, the requirement to makeup the MWD hang-off collar below the liner hanger necessitates rig floor activity, placing personnel within the red zone while components are made up and the tool offset is recorded for accurate high-side placement.

Additionally, because flow-rate requirements vary for multilateral equipment used during each operation's phase, multiple MWD tool sizes are necessary during junction construction. The positive pulser used during traditional MWD requires placement in line with the tubing flow, causing a restriction that prevents the use of ball drop activities when run above the service tool. This can result in the loss of the contingency release mechanism during completion deflector deployment. Finally, the requirement to run float valves below the traditional MWD system presents potential debris tolerance issues, which could be problematic during operations that require lost circulation material displacement.

SOLUTION

To validate the COT design update, the redesigned components were run successfully using the WOT platform during field trials in 2014. Based on positive results, the tool was recommended for technical qualification for field use with a Norwegian operator's multilateral wells and first run in 2017. The WOT addresses the issues associated with traditional MWD—the 3-inch through-bore allows it to be run above the liner hanger and deflector setting tools without sacrificing the contingency setting option. By eliminating the requirement to run a float valve below, the tool's inner diameter is free from potential blockages because no debris tolerance issues exist. The significantly lower operating flow rates (250 LPM minimum) help eliminate the need to run different MWD tools during subsequent operation phases, resulting in additional time savings and reducing equipment requirements for multilateral junction construction.

Essentially, the WOT eliminates the requirement to run MWD equipment on an inner string below the liner hanger/packer setting tool used in junction deployment. This minimizes the need for personnel in the red zone during the equipment makeup procedure and results in a direct risk reduction.

RESULTS

Since its initial field trial, the WOT has been deployed successfully more than 130 times within the Norwegian North Sea. Compared to the inner string makeup activities required with MWD for junction deployment, the WOT provides significant time savings by reducing string makeup requirements. Additionally, the tool's sufficiently low operating flow rates are compatible with the complete suite of multilateral completion running tools, thus lessening overall equipment requirements. These features directly reduce the potential HSE risk associated with personnel on the rig floor.

Throughout the case history's progression, design updates have expanded the tool's potential scope. The latest generation is now suitable for re-entry applications when used with the XTREMEGRIP® MLT anchor system.

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