

Smart Entry into Multilateral Wells with Coiled Tubing Fiber Optic Telemetry

Syed M. Danish¹ and Bruno Hardegger¹

¹Production Solutions, Halliburton, Al Khobar, Eastern Province, Saudi Arabia.

ABSTRACT

Verifying that conventional coiled tubing (CT) has entered the correct lateral of a multilateral well can be a time consuming and tedious challenge. While passing the kick off point (KOP), it can be unclear to see, from surface pressure sensors, some indication that a hydraulic knuckle joint has kicked over into the lateral. To verify which lateral has been entered, the CT must be run-in-hole (RIH) to tag the unique total depth (TD) of the lateral. It can be difficult to prove that the correct lateral has been entered if the TDs for two laterals do not differ significantly. If the CT tags before or after the expected TD is reached, then the operator must pull out of hole (POOH) and repeat this process. This paper presents a more efficient method to detect which lateral has been entered shortly after passing the KOP by utilizing a real-time, fiber optic (RTFO) bottom-hole-assembly (BHA) which includes sensors for Gamma Radiation, Tool Inclination, Tool Face, CCL, Internal and External Pressure and Temperature readings. These readings allow the operator to use the CCL and Gamma Detector to correlate to the desired lateral's pipe joints using an existing CCL/GR log, use the Tool Face reading to theoretically predict which angle the knuckle joint should be indexed, give clear indication of pressure changes when a hydraulic knuckle joint has kicked into the lateral, and use the inclination sensor to verify that the inclination of the BHA matches the inclination of the desired lateral. Two dual-lateral water injection wells are discussed in this paper and the TDs of the laterals in the first well were equal, with no trait that conventional coiled tubing would be able to distinguish. Additionally, the inclination of each lateral was very close to the other, making the difference of pipe weight, read from surface, not significantly different enough to verify which lateral had been entered. However, with the RTFO BHA, the correct lateral was easily entered and verified, saving significant time, risk, fluids, and coiled tubing pipe fatigue while adding reassurance that the stimulation fluid was accurately placed. This was the first time a flow through Gamma, Inclination, Tool Face sensor module using fiber-optic telemetry has been deployed to accurately enter, identify, and stimulate a cased-hole multilateral well without cycling the CT at the KOP nor relying on tagging TD to confirm the BHA is inside the desired lateral.