CASE STUDY

HALLIBURTON

Permian Basin

At-bit weight measurements from Cerebro Force™ in-bit sensing increases ROP by 20%

High-frequency in-bit downhole measurements used to improve lateral drilling efficiency

CHALLENGE

- Understand weight transfer from surface to downhole in lateral production section
- Identify associated downhole dysfunctions
- Determine the effects on performance

SOLUTION

- Run Cerebro Force™ in-bit sensing with auto-driller settings in WOB mode and ROP mode to compare and identify higher dysfunctions in axial, lateral, and torsional directions
- Drill lateral intervals in each mode at various setpoints to analyze results and determine optimal settings
- Optimize drilling practices based on results

RESULT

- Increased bottomhole ROP by 20%
- Improved dull bit condition
- Mitigated dysfunction
- Improved lateral drilling efficiency

Challenge

When drilling a lateral production section in an unconventional well, an operator aimed to determine the effective transfer of weight and torque from the surface to the bit, the associated downhole dysfunctions, and their impact on performance.

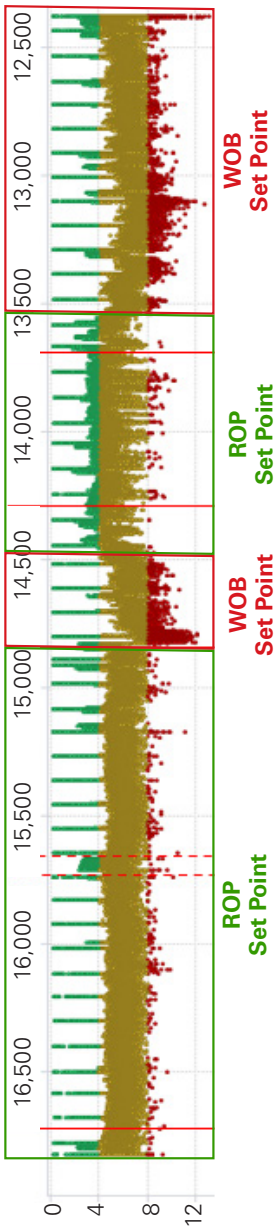
Solution

Cerebro Force™ in-bit sensing with its high-frequency 1,024-Hz measurements was utilized to achieve these goals. This technology would help understand these factors, improve drilling practices, and enhance overall performance in the lateral section.

Cerebro Force in-bit sensing was run with auto-driller control settings in both WOB and ROP modes to compare and identify higher dysfunctions in axial, lateral, and torsional directions. High-frequency data (1,024-Hz) revealed that drilling in ROP mode at a setpoint of 150 ft./hr. created lower magnitudes of axial, lateral, and torsional vibration compared to drilling in WOB mode at a setpoint of 35k lb.

Stands drilled in WOB control mode at a setpoint of 35k lb. exhibited steady surface WOB and varying instantaneous ROP, which causing varying depth-of-cut (DOC). These ROP observations were consistent with downhole WOB (DWOB) measurements by Cerebro Force in-bit sensing. It was also observed that WOB diverged when tool joints passed through the rotating head.

In contrast, stands drilled in ROP mode at a setpoint of 150 ft./hr. exhibited steady ROP and consistent DOC, resulting in less dysfunction. Drilling in ROP



mode delivered a consistent DWOB by applying more surface WOB while drill pipe joints passed through the rotating head.

During subsequent runs, based on observations from Cerebro Force in-bit sensing, the auto-driller was set to ROP mode at a higher setpoint of 180 ft./hr. to mitigate dysfunction, prolong tool life (drill bit, PDM, RSS, and other BHA components), and improve drilling efficiency.

Result

Using at-bit weight measurements provided by Cerebro Force in-bit sensing, the operator optimized the auto-driller control mode and set points, engaging the PDC cutting structure at a constant DOC. This optimization increased on-bottom ROP by 20% and improved dull conditions by mitigating harmful dysfunctions arising from variable DOC conditions.