CASE STUDY

Custom Bit Design Overcomes Drilling Mechanics Issues, Significantly Improves Performance

Drillbit performance analysis reduces BHA damage and stabilizes RSS to eliminate risk of shock and vibration

CHALLENGE
Design a drill bit to overcome stick/slip, severe shock and vibration, and erratic rpm.

SOLUTION
Use IDEAS® integrated drillbit design platform to analyze drilling parameters and evaluate drilling mechanics issues in the field. Compare bit performance to identify best bit design.

RESULTS
Documented significant reduction of shock and vibration and stick/slip when using SDi519 directional drill bit designed with the IDEAS platform. Final reports indicated drilling mechanics issues faced by other manufacturer’s bits were related to the bit design itself.

Improve bit performance to reduce stick/slip and shock and vibration
An operator was drilling the 16-in section of a well when they encountered high stick/slip and severe shock and vibration, which inhibited drilling performance. The operator was using a conventional drill bit, and decided to try a bit from Smith Bits and compare performance in a drilling mechanics analysis across this well and the 16-in sections of the next two planned wells in the same field.

Optimize drill bit to mitigate drilling risks
In the first well, the other manufacturer’s bit was used to drill from 420 to 1,534 m with documented shock and vibration and stick/slip, as well as low response from the rotary steerable system (RSS) and erratic rpm. At that depth, the team switched to an SDi519 directional PDC drill bit designed by the IDEAS integrated drillbit design platform. The IDEAS platform was used for simulation and analysis to certify the bit and cutting structure design specifically for this application—a method proven to significantly reduce stick/slip and the risk of shock and vibration in even the most abrasive environments. The resulting custom-designed bit drilled from 1,534 to 2,013 m with no shock and vibration or stick/slip issues.

Two additional wells were drilled. The SDi519 directional PDC bit drilled from 425 to 1,812 m in one well, and the conventional bit drilled from 332 to 880 m in the second well. Again, drilling mechanics analyses and comparison showed severe shock and vibration for the other manufacturer’s bit and no notable issues for the SDi519 fixed cutter drill bit. With the SDi519 bit, the RSS response also stabilized and BHA component wear was reduced.

Using the SDi518 directional drill bit custom designed with the IDEAS platform, the team documented significant reduction of drillstring dynamics issues such as shock and vibration and stick/slip.

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Eliminate drilling risks with superior design

In the postjob analysis of performance and drilling conditions based on both companies’ drilling mechanical logs, it was concluded that the SDi519 PDC drill bit designed using the IDEAS platform drilled its 16-in sections without trouble. When the alternative bit was used in the same field for the same hole size, the BHA experienced high stick/slip and high-to-severe shock and vibration. The operator and Smith Bits determined from the comparison analysis that the drilling mechanics issues faced by the other manufacturer’s bit were related to drillbit design. The team indicated in final reports that the SDi519 directional drill bit proved its ability to deliver superior performance and a drilling environment conducive to safer operations.

Comparison of the performance data from bit runs showed no issues associated with shock and vibration or stick/slip when using the SDi519 PDC drill bit. The alternative bit encountered severe drilling mechanics issues.