AxeBlade Bit Increases ROP 29% and Improves Directional Control in Eagle Ford Shale Interval

Ridged diamond element bit improves drilling rates while enhancing steerability with reduced reactive torque

### Challenge

Achieve high instantaneous ROP and enhance toolface control while drilling with a high differential pressure motor in limestone and shale formations, Eagle Ford Shale.

### Solution

Deploy the AxeBlade* ridged diamond element bit to drill the curve and lateral intervals.

### Results

- Drilled 3,586-ft [1,093-m] interval in 35 hours for an ROP of 102.5 ft/h [31.2 m/h], an improvement of 29% compared with previous wells.
- Held toolface, built angle, and reduced reactive torque compared with baseline bits.
- Showed better dull condition compared with offset runs.

“I was impressed with how well the bit held tool face and built angle compared with the baseline bit with standard cutters. The reactive torque was reduced significantly compared to bits we used in the past.”

Directional driller
Eagle Ford Shale drilling operation

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**Enhance ROP while maintaining toolface control**

An operator in the Eagle Ford Shale of Texas designed a well where the curve and lateral intervals would be drilling through limestone and shale formations with unconfined compressive strengths between 6,000 psi [41.4 MPa] and 15,000 psi [103.4 MPa]. The curve consisted of limestone and shale interbeds, which can cause issues with toolface control when sliding through the transitions.

The operator sought to drill the interval using a single BHA with high differential pressure motors, ranging from 500 to 1,200 psi [3.4 to 8.3 MPa] of differential pressure. The ideal drill bit would deliver high penetration rates and enhanced toolface control while withstanding high differential pressure.

**Customize AxeBlade bit to meet objectives**

Schlumberger suggested the AxeBlade* ridged diamond element bit to achieve the desired performance. The ridged diamond element combines the shearing action of a conventional PDC cutter with the crushing action of a tungsten carbide insert (TCI) to cut rock more efficiently. The cutters’ unique geometry delivers higher instantaneous ROP, reduces overall torque, creates less reactive torque fluctuation, and improves toolface control.

The IDEAS* integrated drillbit design platform was used to simulate the directional response of a formation transition in the curve section. The AxeBlade bit showed less overall torque and held toolface angle through the shale and carbonate transition better than the offset bit.

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*In finite-element analysis simulations, the AxeBlade bit demonstrated good toolface control throughout the entire curve section. The offset bit loses toolface control when the formation changes from shale to carbonate.*
CASE STUDY: AxeBlade bit improves ROP by 29% and improves directional control in Eagle Ford Shale interval

Better toolface control and 29% faster ROP
Using the AxeBlade bit, the operator drilled 3,586 ft in 35 hours for an ROP of 102.5 ft/h—an improvement of 29% compared with the performance achieved in two offset wells on the same pad. Additionally, the bit successfully landed the well with enhanced toolface control and resulted in a better dull condition compared with the offset runs.

The AxeBlade bit (above) was POOH with a dull grade of 1-1-CT-NS-IN-BT-TD. The offset bit (below) was POOH in worse condition with a dull grade of 0-3-CT-NS-IN-SPA-TD.

The AxeBlade bit drilled the same interval as offsets with significantly higher ROP.