

Case study: Southern Bolivia

Kymera hybrid drill bit saves 23 drilling days in exceptionally complex formations

South Bolivia's formations found in the carboniferous and Devonian periods present highly challenging geological conditions and unique complications that present many drilling challenges. Among them are uncertainties in structural mapping, presence of faults, high variations of unconfined compressive strength, and high shock and vibration environments. In addition, the lithology is inconsistent with hard stringers, highly abrasive sands, claystone, siltstones and shales.

These conditions have caused numerous drilling problems, including short runs, premature bit wear, downhole equipment breakages, technical and geological sidetracks, and stuck bottomhole assemblies. All of these costly and time-consuming issues have driven operators to select robust, yet relatively low-performing bit designs and drilling systems, to reduce breakage risk and mitigate losing expensive equipment downhole.

Combined, these conditions have caused numerous drilling problems that have led to operators spending more than one year drilling a single well.

The Baker Hughes Bolivia Drill Bit team, along with the **Kymera™ hybrid drill bit** design and development team in Houston, worked with a customer to optimize a drill bit that would withstand the harsh challenges presented by the variety of lithology in this field.

The solution was an 18 ¼-in. Kymera hybrid drill bit, which used the latest Kymera Mach 5 analytical modeling software to develop specific TCI cutter engagement to deliver superior bit life and rate of penetration (ROP) for this application. The bit also had **Stabilis™ reinforced cutter technology** to provide the durability and drilling efficiency the application required, reinforced shoulders through ShadowCut technology, and tapered roller bearings to increase overall bearing life and stability.

The superior design features of the 18 ¼-in. Kymera hybrid drill bit delivered optimum and anticipated durability/reliability and lead to the drilling of a faster and less problematic well.

The Kymera bit's stable design increased drilling efficiency and provided steady drilling during four runs through a total of 1790 m (5,873 ft) of ratty formation. At 3.26 m/hr (10.7 ft/hr), the Kymera bit delivered 46% improvement in overall ROP performance in the section.

The customer gained 23 drilling days, and the four-run operation contributed to two new records: the longest single run in the more complex formations vs. offsets of which 565 m (1,854 ft) at 2.51 m/hr (8.2 ft), and the longest run in the field at 662 m (2,172 ft) at 4.6 m/hr (15 ft/hr).

Challenges

- Premature bit wear leading to short runs
- High levels of vibrations in interbedded, hard and abrasive formations prone to wellbore instability
- Low ROP

Results

- Saved two trips
- Saved 23 drilling days
- Improved ROP 46% over best offset
- Recorded longest run vs. offsets with 662 m, of which 565 m was in the carboniferous/Devonian formations