Montney drilling benefits from targeted bit design, cutter development

Cutters comprised of a new diamond material composition were 30% more thermally stable with 20% higher abrasion resistance.

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Changes in bit design and cutter enhancement aimed specifically at Canada's abrasive Montney Formation have significantly improved drilling performance in the competitive play. Altering bit wear profile, cutter positioning and other bit characteristics resulted in a 38% to 61% ROP increase and 55% to 105% increase in meters drilled in two different Montney applications.

The Montney is an abrasive, medium-to-fine grained lithology composed of interbedded siltstone and shale with dolomitic siltstone and fine-grained sandstone in the upper layers. The bit application is rotary and motor drilling in the horizontal section. Bits used in this hole section must typically address low-impact, high-abrasion conditions, although impact does occur when steering in and out of the formation.

To increase ROP and meters drilled, a Varel 156-mm (6⅛-in.) V613PDUX polycrystalline diamond compact bit was modified over several design iterations. Varel's proprietary design software allowed designers and field engineers to specifically address the formation and application.

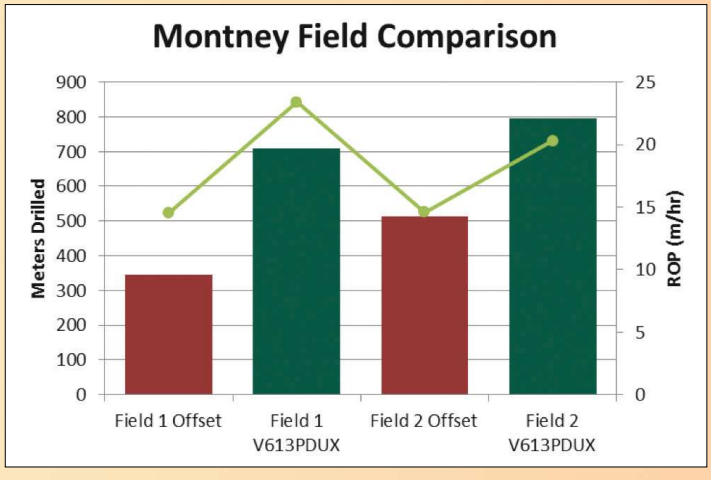
The program employs advanced algorithms, rock analytics, and extensive field operating and performance data directly from the rig to determine how changes in bit features will affect bit steerability, balance, cutter loading and vibration control for a particular well trajectory and bottomhole assembly.

The objective and end result of the bit redesign was to increase the average ROP from about 12 m/hr (39.4 ft/hr) to 15 m/hr (49 ft/hr) to 15 m/hr to 19 m/hr (62.3 ft/hr) while increasing the number of meters drilled from 300 m (984 ft) to 500 m (1,640 ft) to about 700 m (2,296 ft) to 800 m (2,624 ft).

The first design iterations were directed mainly at durability, which also would positively affect overall ROP. It repositioned cutters to more evenly distribute loading forces across the face of the bit and increase the diamond volume coming in contact with the formation. That improved performance but did not meet the final ROP and meters drilled objectives.

That led to the final design iteration, where cutters comprised of a new diamond material composition were incorporated. The cutter was developed in the Varel Technology Center using proprietary tests for measuring material toughness, abrasion and thermal stability. The new cutter is 30% more thermally stable and has 20% higher abrasion resistance than previous Varel cutters.

The Varel bit development process directly improved drilling results in the Montney Formation. The combination of bit design and cutter research supported the successful development of a targeted bit achieving the goals for this application. EP



The total number of meters drilled and ROP both increased in the Montney Formation using a new diamond material composition that was incorporated in the cutter. The composition was developed in the Varel Technology Center. (Source: Varel International)