

Latest Bit Designs Drill Faster, Farther

By Colter Cookson

Human beings are exploring deep space, eradicating diseases, designing pilotless planes and cars, and placing horizontal wells with multi-mile laterals on target. Psychologists say we do so much in part because we all share a desire to accomplish big things. For the humans in the oil and gas industry, that means celebrating even their greatest successes for only a few days, then getting to work on the next challenge.

Nowhere could that dynamic be more obvious than in the world of drill bits. Instead of resting after record-setting runs, bit engineers analyze their designs' performance to identify and address the barriers that keep them from drilling even faster and farther.

Their efforts are paying off. PDC makers say their latest designs deliver significant improvements in speed and durability by optimizing hydraulics, enhancing backup cutters, leveraging modern motors, and minimizing reactive torque. Meanwhile, the newest roller cone and hybrid bits employ advanced cutters and application-specific cutter configurations to set new standards for drilling efficiency and durability.

Gouging Hybrid

Shear Bits reports that it continues to refine the design for its Pexus™ hybrids, which protect PDC cutters with gouging inserts. "These inserts fracture the formation ahead of the cutters, reducing the amount of impact damage they take," says Wayne Miller, the company's sales and operations manager. "They also smooth torque, so the motor and other

tools in the bottom-hole assembly see less vibration."

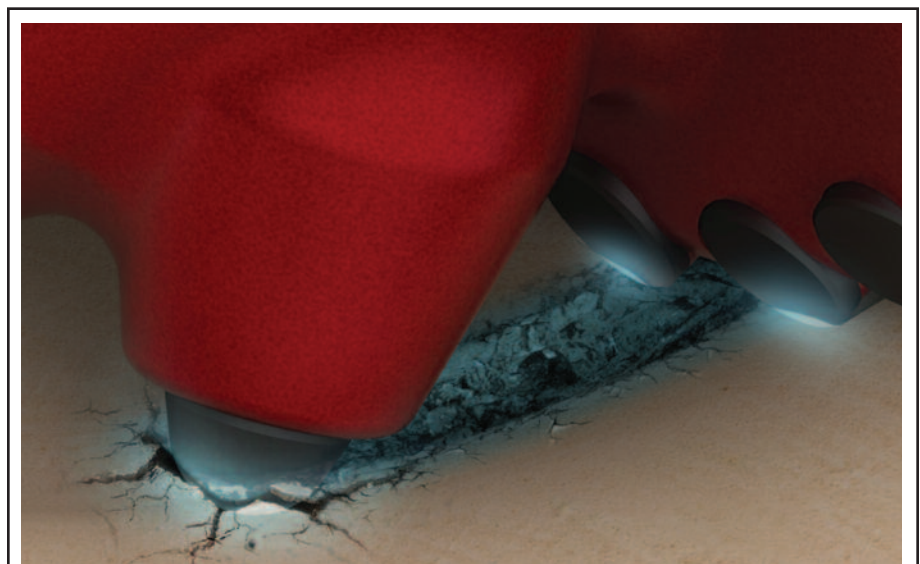
While the gouging hybrids originally were developed to drill through gravel and boulders normally only drillable with roller cones, Miller says Shear Bits has adapted the concept to a variety of applications, including formations traditionally drilled with PDCs. In long, highly-interbedded intervals, he says the hybrids' ability to extend cutter and BHA life often translates into higher ROPs.

"We also are replacing PDCs in intervals where the formation is tough throughout. In this situation, PDCs are used over roller cones because roller cones can drill only so many hours before their bearings

wear out," Miller says. "Our hybrid offers steerability and durability comparable to a roller cone, but can stay in the hole much longer."

Since their debut in 2013, Miller says the gouging hybrids have completed more than 1,400 runs and drilled 3.5 million feet of rock. To show how well they perform, he cites a case in Canada where the bit had a direct offset drilled by the same operator using the same BHA and well profile.

"After drilling the vertical section, the operator would pull out of hole and put on a new BHA to drill the curve," Miller recalls. "The interval is tough and full of transitions, so for the offset, the operator



Shear Bits' Pexus™ inserts gouge the formation ahead of the PDC cutters, protecting them from impact damage and allowing them to shear more efficiently. Because the inserts extend bit life, the company says they increase penetration rates and footage drilled in a variety of applications, including intervals with tough or highly-interbedded formations.

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used a roller cone hybrid to minimize torque and vibration that could compromise tool face control. It drilled 764 feet at an average speed of 28 feet/hour.

“The Pexus had comparable vibration and tool face control, but drilled 1,168 feet at an average speed of 38 feet/hour,” he reports. “Because of the gouging action’s efficiency, it also required 65 percent less weight on bit.”

Another Canadian operator chose a gouging hybrid to drill laterals in an area with abrasive sands containing hard dolomite stringers. According to Miller, most of the offsets drilled 1,000-2,000 feet. By prefracturing the rock and keeping the cutting structure sharp through the

stringers, the Pexus not only drilled the first lateral leg, but also pulled back into the hole to perform an open-hole sidetrack and complete the second leg to total depth on the same BHA.

“In total, the hybrid drilled 9,000 feet,” Miller reports. “This is one of the first times we have seen any bit complete both a lateral and a sidetrack through dolomite stringers, and it did it at an ROP about 30 percent faster than the offsets.”

Miller points out that Shear Bits is adapting the gouging hybrid concept to remove frac plugs and sleeves. “Because frac plugs and sleeves have so many components and parts, there are a lot of interrupted cuts,” Miller says. “Gouging inserts

can protect the cutters and help them transition from one material to another.”

In one application, the plug and sleeve bit drilled 30 percent faster than roller cones and 43 percent faster than reverse clutch mills, says J.J. Herman, the company’s co-founder. In another, a single bit drilled 34 frac sleeves before being pulled out of hole to drill seven more in another well.

“The strength of the gouging mill is that the cutting structure stays sharp from the beginning of the run to the end,” Herman comments. “As a result, it maintains higher efficiency and gage throughout, making it easier to put tools down the well in the future.” □