

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 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.

Roller Cone Inserts

Leveraging more than a century of research and development, Smith Bits, a Schlumberger company, reports it has developed roller cone cutter configurations that withstand high temperatures and long run times when drilling through soft to ultrahard formations.

As an example, Bit and Drilling Tools Product Champion Wiley Long presents the Xplorer Helix™ spiral tungsten carbide insert configuration for the company's pre-

mium performance roller cone bit family.

"Conventional cutting structures feature concentric rows of teeth that create ridges of rock. This works, but the teeth often track into grooves and craters in between the ridges," Long says. "In addition to wasting energy, tracking can damage the inserts. By staggering them in a spiral array, we put more of the inserts into contact with new rock, limiting damage and increasing cutting efficiency."

Field tests confirm that this spiral configuration reduces damage and improves ROP, Long says. He indicates the ROP increase generally exceeds 20 percent, but can exceed 50 percent in the right applications.

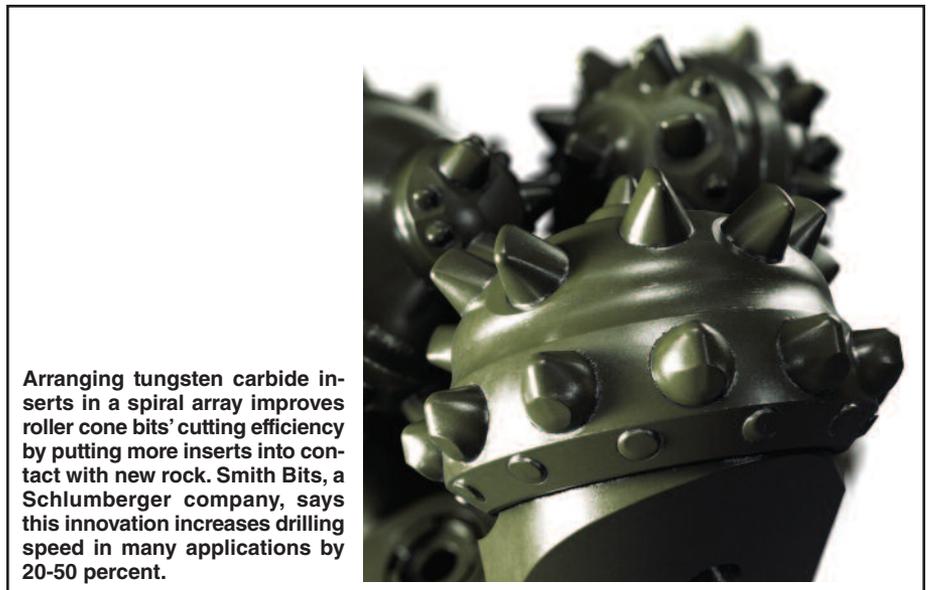
"We developed the Xplorer Helix configuration using our integrated dynamic design and analysis platform," Long notes. "It took careful planning and modeling to optimize the drilling dynamics and ensure that staggering the inserts would not interfere

with the patterns on the bits' other cones."

Long says the Xplorer Helix configuration is available globally, and has been applied in multiple environments around the world.

For example, the Kuwait Oil Company selected an Xplorer drill bit with the Xplorer Helix configuration to increase ROP while drilling 4,500 feet intervals through interbedded soft and hard formations. The operator needed to drill a 28-inch vertical section from 500 to 5,000 feet through limestone, dolomite, anhydrite and shale layers, Long details.

Because this section had unconfined compressive strengths ranging from 6,000 to 24,000 psi, Long says previous bits' cutting structures would break and chip, which reduced penetration rates. "With the spiral configuration, the cutting structure, seal and bearing lasted long enough to drill the section in one run. This saved four drilling days and increased ROP by 107 percent," he reports. □



Arranging tungsten carbide inserts in a spiral array improves roller cone bits' cutting efficiency by putting more inserts into contact with new rock. Smith Bits, a Schlumberger company, says this innovation increases drilling speed in many applications by 20-50 percent.