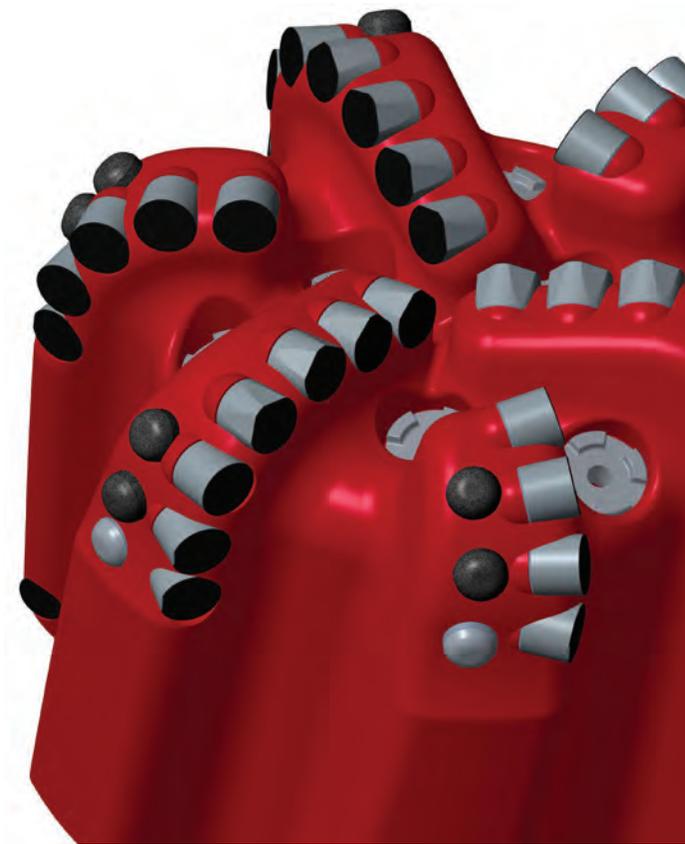


Sabertooth Cutting Structure

Our unique Sabertooth™ cutting structure combines the benefits of full round PDC cutters and ION™ shaped PDC cutters. The Sabertooth design is created by alternating full round cutters and shaped PDC cutters to increase drilling efficiency. ION cutters are at the leading edge of technology in the industry, as they use high-performance diamond grades that are fine-tuned to overcome application-specific challenges. Combined with application-specific shapes, ION cutter technology delivers record-breaking performances all around the world.

There are two primary versions of this alternating Sabertooth pattern; alternating-by-cutter or alternating-by-blade. Alternating-by-cutter places a full round cutter between two 3D cutters, based on the engineered two-dimensional cutter layout. Alternating every blade places the same type of cutter on one blade, adjacent blades contain the opposite cutter type. Both versions provide improvements in ROP, lower torque, and increased footage compared to traditional full round cutting structures.

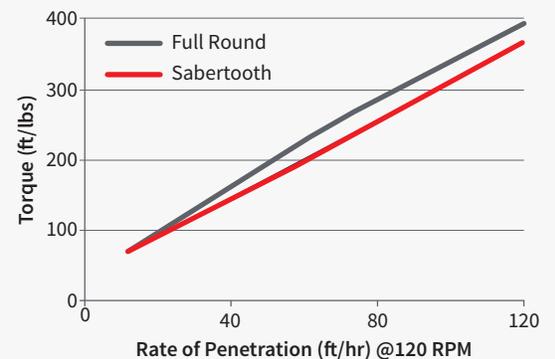


Increased ROP at lower torque

Due to their pointed geometry, shaped cutters generate comparable ROPs at a lower weight on bit (WOB). In field and lab tests, Sabertooth cutting structures have shown a 10% decrease in WOB over traditional cutting structures. The extent of the reduction in WOB is formation dependent; higher WOB reductions are seen in carbonate and sandstone formations, and a lower reduction is seen in softer shale formations.

The lower WOB also reduces the overall torque for a given ROP. The provided graph compares torque values using a Sabertooth cutting structure versus a standard cutting structure. The Sabertooth cutting structure exhibits approximately 10% lower torque levels.

Torque comparison



Increased footage

By reducing weights and limiting torque, Sabertooth cutting structures minimize the potential for cutter damage and effectively allows the bit to drill longer intervals faster. Decreasing the WOB lowers the cutter force loads, which cause breakage, chipping, and other forms of damage. The potential for cutter damage is minimized thus increasing bit durability. Broken and chipped cutters quickly lose effectiveness and can cause further damaging situations.