StingBlade
Conical diamond element bit
The unique 3D geometry of the Stinger* conical diamond element has proven to increase bit performance across a wide range of formations and operating parameters.

Positioning Stinger elements across the bit face delivers a step change in drilling performance and rock failure.

StingBlade* conical diamond element bits provide multiple advantages over conventional PDC bits.

- Significantly improved footage and ROP
- Higher build rates with better toolface control
- Enhanced bit stability for BHA shock and vibration mitigation
- Larger cuttings for better surface formation evaluation at the rig site
Efficient rock destruction

Smith Bits engineers optimized the Stinger element’s 3D conical geometry using finite-element analysis (FEA) to model the precise point at which the element’s tip contacts the formation. The result is an ultrahigh-concentrated force that fractures high-compressive-strength rock more efficiently.

Stinger elements apply a significantly higher concentrated point load on the rock, and the elements’ thicker diamond table enhances impact strength and wear resistance. This combination enables StingBlade bits to significantly improve footage and ROP in challenging drilling applications—including hard, interbedded, conglomerate, and chert- and pyrite-inclusive formations—that can cause impact damage to conventional drill bits.

During field tests of more than 250 runs in 14 countries, StingBlade bits averaged a 55% increase in footage with a corresponding 30% increase in ROP compared with bits used in offset wells.

The Stinger element’s thicker diamond layer facilitates greater wear resistance and impact strength compared with PDC cutters.

FEA modeling shows that the Stinger element (right) enacts a higher stress on the formation, fracturing high-compressive-strength rock more efficiently compared with a conventional PDC cutter (left).
In comparison tests at 18,000 lbf, the PDC cutter (left) failed on the first impact; the Stinger element (right) survived more than 100 impacts. Watch the video at slb.com/StingBlade.

During lab testing, the Stinger element consistently showed greater wear resistance than PDC cutters when drilling a hard granite. Watch the video at slb.com/StingBlade.

Impact strength
Stinger elements have a thicker diamond table compared with PDC cutters, yielding significantly improved impact strength. When impacted onto hardened steel at more than 18,000 lbf to simulate drilling into a high-compressive-strength carbonate at 60 ft/h, a conventional PDC cutter experienced a catastrophic failure on the first impact while the Stinger element survived more than 100 impacts with no damage.

Wear resistance
Composed of a state-of-the-art blend of polycrystalline diamond materials and built into a unique conical shape, Stinger elements dissipate heat more efficiently than conventional PDC cutters for improved wear resistance. When a Stinger element and a PDC cutter were tested by drilling a 30,000-psi granite formation, the Stinger element drilled 30% farther than the PDC cutter without losing its cutting edge.
StingBlade Bits Save More Than 5 Days in the Browse Basin, Offshore Australia

**Case Study: Improved footage and ROP**

Challenging section adds time and cost to the well

An operator planned to drill a 12¼-in vertical section in the Browse basin offshore Australia through the challenging Dampier, Heywood, Baudin Marl, and Wollaston Formations. These formations are composed of interbedded hard limestones and chert with high compressive strengths, which induce heavy damage to conventional PDC bits. Such damage slows ROP and requires the operator to pull bits prematurely, requiring more time to drill the section.

**StingBlade bits optimize drilling performance**

To improve bit durability and ROP, Smith Bits, a Schlumberger company, recommended using StingBlade bits. Engineers used the IDEAS® integrated drillbit design platform to determine the optimal placement of Stinger elements across the bit face. The Stinger elements’ 3D conical shape is designed to fail high-compressive-strength rock with a concentrated point load. The elements also have a thicker diamond layer for maximum strength and durability. This enables StingBlade bits to drill farther through formations that typically cause impact damage to PDC bits.

**Improved ROP saves more than 5 days**

The first StingBlade bit drilled 1,516 m at 11 m/h, equaling 97% more footage than the best run in the same section of the offset well. ROP also improved by 57% in this run. The second StingBlade bit drilled the remaining section to TD at an average ROP of 16 m/h. Altogether, the two StingBlade bits helped the operator save more than 5 days of drilling time.
Case Study: Improved footage and ROP

GMT Exploration Improves Footage and ROP, Saves 2.5 Drilling Days

Drill challenging interval with transitioning formations
GMT Exploration planned to drill three horizontal wells in the Bone Spring Formation, located in the Delaware basin section of the Permian basin. These wells have challenging 77⁄8-in intermediate intervals composed of interbedded shales, limestones, and sandstones, which typically require multiple PDC bits because of slow ROPs caused by impact damage to the PDC cutting structure.

Optimize drilling using StingBlade bits
Smith Bits recommended StingBlade bits. Engineers used the IDEAS platform to determine the optimal placement of the Stinger elements for the specific application. The Stinger elements’ 3D conical shape is designed to fail high-compressive-strength rock with a concentrated point load while maximizing strength and durability with a thicker diamond layer. This enables StingBlade bits to drill farther through formations that typically cause impact damage to PDC bits.

Saved 2.5 days across three wells
One StingBlade bit drilled 4,030 ft at 57 ft/h, which increased footage by 77% and ROP by 29% when compared with the average performance of bits used in offset wells. On the following two consecutive wells, StingBlade bits repeated the performance improvements over the average offsets; the second run had 73% greater footage and 26% greater ROP, and the third run had 44% improved footage and 10% higher ROP. Between the three wells, GMT Exploration saved 2.5 drilling days.

Offset analysis results show that StingBlade bits achieved some of the longest runs and fastest penetration rates compared with conventional PDC bits.
When drilling directionally, high reactive torque fluctuations caused by the bit can lead to slower-than-expected ROPs, decreased build rates, and greater risk of missing drilling targets. These issues can add time and cost to drilling operations and potentially decrease production efficiency.

Stinger elements drill with less overall torque than PDC cutters, reducing reactive torque fluctuations in formations with various compressive strengths or with sudden changes in operating parameters such as WOB.

This allows StingBlade bits to yield higher build rates, to stay on target better, and to achieve directional drilling objectives in less time, including when drilling unconventional curve sections.

As ROP increases, a Stinger element (green) drills with an average of 26% less torque compared with a conventional PDC cutter (gray), providing better directional response and smoother toolface control.
Operators and directional drillers continue to face issues with steerability and toolface control of conventional PDC bits when drilling curve sections in unconventional wells. Bits containing rolling cones can suffer from reliability issues and low rates of penetration, resulting in operating hour limitations and the ever-present chance of losing cones downhole.

A controlled field test was carried out comparing the directional response of a StingBlade bit and a PDC bit in an unconventional curve section. Both bits were run in adjacent boreholes less than 50 ft apart, kicking off at identical depths and using the same rig, steerable motor, BHA, and directional drillers.

The StingBlade bit yielded 23% higher build rates and had less overall torque and toolface-angle fluctuations, making it easier for the directional drillers to stay on the planned curve trajectory.

One of the directional drillers who ran the test bits said, “I was surprised to find how easy the StingBlade bit was to steer. It had very little reactive torque; all it took was a little tweak to the right or left to maintain toolface.”

Field testing confirmed that the StingBlade bit drilled at a 23% higher build rate than the PDC bit.
Shock and vibration create drilling inefficiencies that lower ROPs and can cause costly downhole tool failures. Because Stinger elements have a more balanced cutting response, StingBlade bits consistently drill with less shocks and vibrations. This increases drilling efficiency to enable longer runs at higher ROPs while also prolonging the operating life of the bit and other BHA components.

Lateral forces can induce unwanted BHA vibrations. Modeling using the IDEAS platform shows that the resultant lateral forces of a PDC cutter are significantly higher than a Stinger element when placed across a cutting structure.

In a simulation of drilling through a 30,000-psi limestone at 20,000-lbf WOB and 175 rpm, the StingBlade bit (green) showed 86% lower lateral vibrations than a conventional PDC bit (gray).
StingBlade Bit Demonstrates Drilling Stability and Efficiency in Interbedded Vertical Application

Operators strive to improve drilling efficiency and increase the operating life of the bit and other BHA components, enabling longer runs and higher sustained ROPs. Unwanted vibrations cause more mechanical specific energy to be required to drill a formation. These vibrations can also damage the bit and other BHA components, causing downhole tool failures, which typically add trips to complete an interval.

A controlled field test was carried out comparing the vibration response of a StingBlade bit and a PDC bit in an interbedded vertical section. Both bits were run in adjacent boreholes less than 50 ft apart, drilling at identical depths and using the same rig, BHA, and operating parameters.

Results from the field test confirmed that the StingBlade bit increased drilling efficiency by producing 53% fewer lateral vibrations and 37% fewer axial vibrations.

In this field test, the StingBlade bit produced 53% fewer lateral vibrations and 37% fewer axial vibrations compared with a conventional PDC bit.
Larger cuttings for accurate surface formation evaluation

The concentrated point loading of Stinger elements enables StingBlade bits to generate larger cuttings. In field tests, StingBlade bits produced a significant amount of >2-mm cuttings by volume when compared with the cuttings generated using PDC bits in similar formations.

Geoservices, a Schlumberger company, can analyze this significant volume of larger cuttings to enhance surface formation evaluation by giving mudloggers the ability to more accurately identify mineralogy, porosity, permeability, geomechanical stresses, and hydrocarbon shows at the rig site.

Early availability of reliable and reproducible measurements allows fast, accurate identification of the lithology and formations being drilled. This information can help operators optimize well trajectory, select logging and completion zones, improve well correlation, and verify downhole measurements.

The cuttings generated by a conventional PDC bit (left) were significantly smaller than those generated using the StingBlade bit (right) in a horizontal field test through the Granite Wash Formation of western Oklahoma.
Zhaikmunai Saves Drilling Days and Enhances Lithology Identification

Increase drilling speed and durability
During operations in Kazakhstan’s Chinarevskoe field, Zhaikmunai LLP, a member of the Nostrum Oil & Gas Group, sought to increase ROP and identify lithology types and properties of a hard carbonate formation with high chert concentration. Diamond-impregnated drill bits were the standard approach due to high durability, but ROP was low and cuttings were small, limiting surface logging formation evaluation. Furthermore, the small cuttings made it difficult to separate them from the drilling fluid, which created a gradual increase in mud weight throughout the interval.

Deliver larger cuttings at high ROP
Smith Bits engineers suggested using a StingBlade bit along with the PowerV* vertical drilling RSS. Stinger elements interact with the formation through a unique rock-destruction mechanism that creates larger cuttings at optimal drilling speeds.

Saved substantial drilling time and mud costs
The integrated BHA drilled the entire planned interval with a 166% increase in ROP compared with offset wells. This improved drilling efficiency saved Zhaikmunai 6 days of drilling time and approximately USD 180,000. Additionally, the larger cuttings produced by the StingBlade bit enabled wellsite geologists to readily identify lithology types and properties. The cuttings were also easier to separate from the drilling fluid, reducing costly mud replacements.
Every StingBlade bit is designed using the IDEAS integrated drillbit design platform.

Smith Bits engineers place Stinger elements across the bit face based on specific formation characteristics and drilling objectives.
StingBlade conical diamond element bit

Optimized bit design with dynamic modeling

With 4D simulation, the IDEAS platform shows how a bit behaves as an integral part of the whole drilling system—drillpipe, MWD and LWD tools, reamers, stabilizers, motors, and RSSs—resulting in a detailed representation of the elements that impact drilling.

The platform simulates the virtual BHA in drilling conditions to analyze rock-cutter interface, drillstring behavior and directional response, and operational parameter changes.

These advantages allow StingBlade bits to give better assurance that drilling objectives are met in the field the first time, reducing the costly process of iterations based solely on field results.
Visit slb.com/StingBlade to learn more about StingBlade bits.

**Animation**
See the StingBlade bit’s advanced rock destruction efficiency.

**Expert Video**
The product champion of StingBlade bits discusses their applications, features, and customer benefits.

**Case Studies**
- StingBlade bits save more than 5 days in the Browse Basin, offshore Australia.
- TAQA saves 1 day, USD 635,000 running StingBlade bit with PowerDrive X6® RSS.

**Related Technologies**

- Directional Drilling Services
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