

# Talon – PDC Bit

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## BACKGROUND

Baker Hughes has always taken a great deal of pride in the quality of products we place in the care of our valued customers and, in an ever changing industry, maintaining such a high standard is a constant effort. These efforts have resulted in our newest and most optimal product to ever reach the marketplace, “Talon.”

The birth of Talon was the result of 2 years, 13 teams of 50 experts and over \$11 million studying, analyzing and testing design after design. The fruits of our labor in this development process revealed many flaws in the industry and competitors approach to drill bit design. The problem did not lie in any one certain area but rather in the compilation of many minor issues compounding themselves to prevent the success that can and will be achieved through Talon. Mitigating the challenges of rate of penetration (ROP), durability, steerability, hole quality, bit balling and build up rate (BUR) has been answered by harmonizing many key aspects that contribute to mechanical, hydraulic and cutting efficiency found in Talon.

## MECHANICAL EFFICIENCY

The mechanical efficiency as it relates to stability, steerability and durability are foundational in ensuring superior performance. The groundwork of this mechanical efficiency begins with the frame design. Baker Hughes went back to the drawing board and test labs resulting in the PT1 & PT2 frame styles for directional applications. Utilizing locations of nose proximity and altering the roundedness of the profile while maintaining the vital center diameter resulted in a more durable product. This optimization proved to be successful in single bit curve and lateral drilling with more satisfactory dull grades. Also needed to achieve this mechanical efficiency and stability was controlling the depth of cut (DOC). Our teams controlled the depth of cut by adding specific features such as blade contact with the blade designs’ cone exposure, managed backrakes and strategic ovoid placement. These features now allowed Talon to maintain an aggressive nature while reducing rubbing, axial aggressiveness and vibrations. Once again, the result was an increase not just in bit durability but also specifically in steerability as needed. The engineered ovoids have been crucial in achieving this level of success by strategically placing them to ensure proper tracking.

## HYDRAULICS

The second part of our performance trifecta comes from advancing bit hydraulics. This thorough process could only be achieved by approaching the situation in a joint effort with computation fluid dynamics (CFD) specialists to ensure superior hydraulic efficiency. Trial and error through many stages using junk slot area (JSA) mapping resulted in reduced cutting accumulation primarily through diverging junk slots. Diverging junk slots enable Talon to retain cross-sectional area down the junk slot once the maximum area is achieved. The final tests resulted in an increase in ROP, increase in aggressiveness and reduced the chances of cuttings trapped in the bit. By reducing the cuttings trapped in the bit, any chances of bit balling are eliminated which can lead to issues that may have detrimental effects to the drilling system as a whole. This leads to a lower mechanical specific energy (MSE) indicating more efficient drilling and higher penetration rates.

## DIAMOND CUTTER

The final piece of the Talon puzzle to be adjusted was the cutter. Often viewed as one of the most decisive and vital parts of the drill bit, Baker Hughes spares no expense at ensuring that not only are our cutters state-of-the-art but also confidential. Being one of the only bit companies partnered exclusively with its cutter designer and manufacturer, Baker has ensured that Talon will maintain its superior cutters and patents. Teamed up with Element 6, Baker Hughes has combined the previously stated features with our new StaySharp Technology. This technology uses improved diamond metallurgy, new interface design, patent polished cutters and an optional erosion resistant substrate. Our tests revealed that the StaySharp cutters penetrated around 40% more formation than the previous Quantec Force cutters through finding a perfect median between impact and abrasion resistance. The addition of the polishing to the cutters has proven to increase ROP’s by upwards of 200% in our simulator while showing a more consistent rate. These new polished cutters are already being offered in 8mm, 11mm, 13mm, 16mm and 19 mm

sizes on our new Talon frames. These premium cutters, aligned with our new longer more erosion resistant substrates offer a relative increase bit quality.

## **CONCLUSION**

All of these components are nothing more than fluff if not put to the test and so enter the Baker Hughes Design Application Review Team (DART Process). This cycle allows the proof to be physical and not just a theory. By partnering our technology, data and designs with that of our valued customers as well as the utilization of the most advanced drilling laboratory in the industry, Talon passed all tests and analysis with the same high expectations Baker Hughes has come to expect out of our products. From conception to vetting and now a proven new industry standard for drill bits, Talon now stands ready to meet the needs and solve the problems our industry has encountered in its vigorous pursuits to drill further and faster than ever before.