Increase efficiency to drill faster

Lancer shaped-cutter technology

Lancer™ shaped-cutter technology from Baker Hughes provides an efficient point loading effect to improve rate of penetration (ROP) in applications where soft formations are combined with tough, ductile formations with moderate levels of interfacial severity. Lancer's efficient cutting action and durability allows for a higher ROP potential while mitigating the risk of tangential failure, which can be a limiting factor in shoe-to-shoe runs. Paired with the Baker Hughes PermaFORCE™ elite PDC dril bit platform, Lancer shaped cutters provide a sharp point loading edge that focuses more weight to a smaller area of the rock, and the unique three-dimensional shape provides a plowing effect to further increase cutter efficiency. This allows a drill bit equipped with Lancer shaped cutters to penetrate ductile high-pressured formations to generate maximum ROP.

DRILL FASTER AND REDUCE RISK

Lancer shaped cutters incorporate the friction reducing face geometry of the CryoCut™ shaped cutter. By recessing the primary cutting face, Lancer shaped cutters decrease the contact zone between rock and cutter face, lowering the friction force. This prolongs the wear life of the cutter in applications to maintain a sharp cutting edge to maximize drilling efficiency.

Lancer shaped-cutter technology was optimized to balance an efficient cutting action with a durable edge to provide fast ROP with longevity. Baker Hughes developed the Lancer shaped cutter using proprietary Finite Element Analysis methods (Figure 1) and extensive lab testing (Figure 2). These engineering methods deliver exceptional performance without compromising the durability of the cutter. Lancer shaped cutters complement the Baker Hughes shaped-cutter portfolio to provide more durability than Apex™ shaped-cutter technology and a ROP improvement compared to Planar and Prism™ shaped-cutter technologies.

OPTIMIZE CUTTER PLACEMENT WITH 3D TETRAHEDRON BIT DRILLING SIMULATION

Placement of the Lancer shaped-cutter technology can be tailored to specific application requirements. Deliberate placement of the shaped-cutters in the right locations within the cutting structure is extremely important to maximize performance without introducing risk of premature damage. Baker Hughes' proprietary

Applications

- Carbonates, anhydrites, salts, and pressured shales
- High mud weight applications
- Intervals with soft formations combined with tough, ductile formations with moderate levels of interfacial severity and abrasiveness

Benefits

- Sharp point-loading tip
  - Penetrate ductile formations more effectively and optimize drilling efficiency
  - Increase ROP
- Recessed face on diamond table
  - Reduce friction to lower heat generation at rock/cutter interface
  - Prolong cutter life and maintain sharper edge
- Designed using Finite Element Analysis to reduce stress in diamond table
  - Improve durability in applications with high cutter forces and moderate impact
- Optimized cutter placement
  - Enhance drilling performance without compromising cutting structure integrity

3D Tetrahedron™ bit drilling simulation software evaluates cutter and bit body interactions with the rock. Complex formation types are modeled, and field-based parameters are used to create a digital twin of the target application. The proprietary cutter force models have been calibrated by lab tests from the high-pressure simulator drilling lab, where the cutting action behaves like downhole conditions. The customized cutter placement process includes the Tetrahedron performance analysis that determines the ROP response and bit aggressiveness for the given cutter layout, rock properties, and drilling mode. The simulation is set up to accurately reflect the application description and is calibrated to reflect the bit damage identified by the dull study for the application. Using this powerful software, our service delivery teams determine the selection of the best drill bit frame for the application and establish the ideal placement. Lancer shaped-cutter technology increases ROP and footage to decrease cost per foot (CPF) for the interval.

Contact your Baker Hughes Drill Bit representative today to discover how Lancer shaped-cutter technology can help lower MSE, improve ROP, increase distance drilled, and ultimately lower your drilling costs.

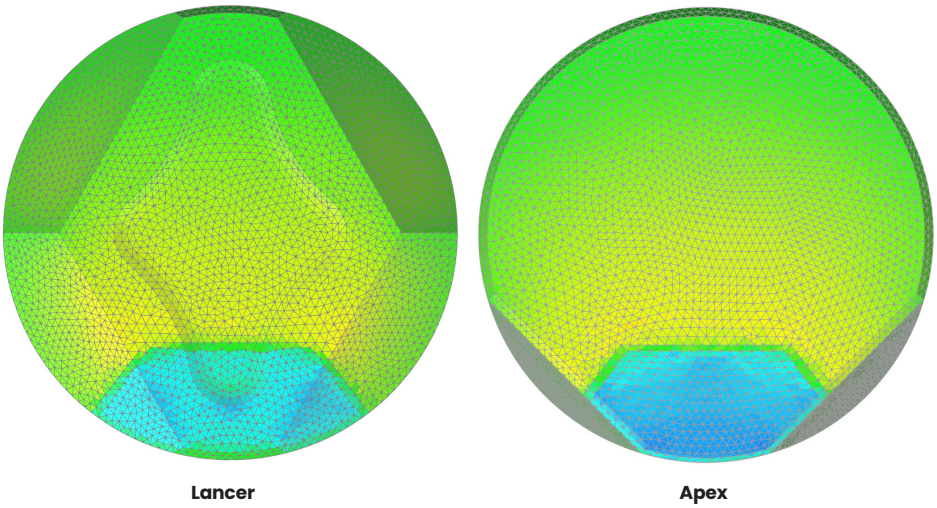

Figure 1: Baker Hughes' proprietary Finite Element Analysis shows a 15% reduction in stresses at the working edge of the cutter under loading conditions

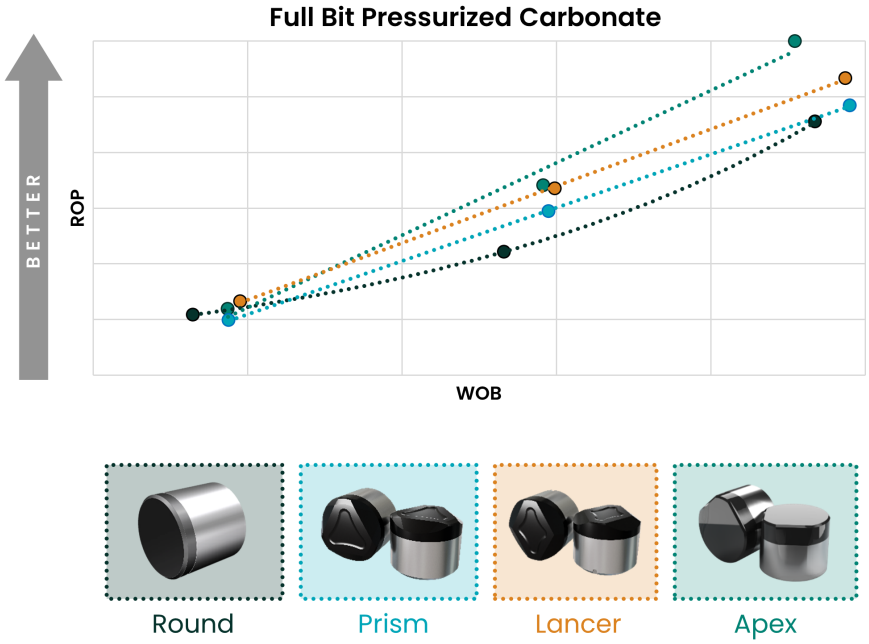

Figure 2: Baker Hughes downhole drilling simulator tests in carbonate rock shows an improved ROP response for a PDC bit designed with Lancer cutters compared to Round and Prism cutters

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