

## Larger Diameter 22 MM-PDC Cutter Greatly Improves Drilling Efficiency of PDC Bit

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**Abstract :** With the increasing speed of oil and gas exploration, development and production at home and abroad, the demand for drilling speed up technology is becoming more and more critical to reduce the development cost. Highly efficient and personalized PDC bit is important equipment in the bottom hole assembly (BHA). Therefore, improving the rock-breaking efficiency of PDC bits will help reduce drilling time and drilling cost. Advances in PDC bit technology have resulted in a leapfrogging improvement in the rate of penetration (ROP) of PDC bits over roller cone bits in soft to medium-hard formations. Recently, with the development of PDC technology, the diameter of the PDC tooth can be further expanded. The maximum diameter of the PDC cutter used in this paper is 22 mm. According to the theoretical calculation, under the same depth of cut (DOC), the 22mm-PDC cutter increases the exposure of the cutter, and the increase of PDC cutter diameter helps to increase the cutting area of the PDC cutter. In order to evaluate the cutting performance of the 22 mm-PDC cutter and the existing commonly used cutters, the 16 mm, 19 mm and 22 mm PDC cutter was selected put on a vertical turret lathe (VTL) in the laboratory for cutting tests under different DOCs. The DOCs were 0.5mm, 1.0 mm, 1.5 mm and 2.0 mm, 2.5 mm and 3 mm, respectively. The rock sample used in the experiment was limestone. Results of laboratory tests have shown the new 22 mm-PDC cutter technology greatly improved cutting efficiency. On the one hand, as the DOC increases, the mechanical specific energy (MSE) of all cutters decreases, which means that the cutting efficiency increases. On the other hand, under the same DOC condition, the larger the cutter diameter is, the larger the working area of the cutter is, which leads to higher the cutting efficiency. In view of the high performance of the 22 mm-PDC cutters, which was applied to carry out full-scale bit field experiments. The result shows that the bit with 22mm-PDC cutters achieves a breakthrough improvement of ROP than that with conventional 16mm and 19mm cutters in offset well drilling.

**Keywords :** polycrystalline diamond compact, 22 mm-PDC cutters, cutting efficiency, mechanical specific energy

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