

3D Scanning and Reverse Design Technology of PDC Bit

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ABSTRACT

The design and manufacturing of PDC bit using conventional techniques experienced some problems like low precision, low efficiency and absence of systematic method. In order to overcome such problems, 3D scanning and reverse design techniques were studied and applied. This paper introduced the 3D scanning and reverse design techniques and their applications, and analyzed their advantages in the development of PDC bit. Taking PDC bit with five blades of $\phi 215.9$ mm and $\phi 16.0$ mm composite chip as an example, this paper introduced the steps of PDC bit 3D scanning and reverse design and specific methods of each step. Field test of PDC bit designed and manufactured using such technique was conducted in a well, after which the wear condition of PDC bit was analyzed. Based on the analysis results, the bit was improved. The improved drill bit was applied in Shengli Oilfield and Changqing Oilfield. The application results showed that such bit had obvious improvement in footage and ROP compared with the prototype bit before reverse design, and the probability of bit balling was reduced as well. The results proved that the design of PDC bit could be optimized, the machining accuracy of bit body could be improved, and the wear condition of bit could be analyzed accurately by utilizing 3D scanning and reverse design techniques, which could also improve the research and application of PDC bit effectively.