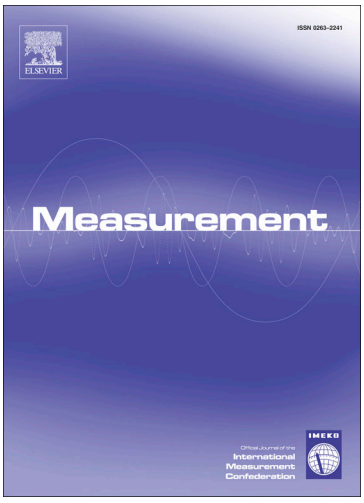

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A novel method for measuring and analyzing the interaction between drill bit and rock

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Abstract

Research on the interaction mechanisms between a bit and rock is a focus of the field of rock breaking theory in drilling engineering. The bottom hole shape, which directly affects the effectiveness of rock breaking at different positions around the bottom hole, is the key factor in research on the interaction between a bit and rock. This paper aims to discuss the influences of bottom hole shape on effectiveness of rock breaking. Firstly we established the mathematical model of rock breaking strength and used it as an evaluation index to analyze the influence of bottom hole shape on effectiveness of rock breaking. Secondly, the relationship between the rock breaking strength and cutting speed, cutting depth, rock lithology and bottom hole shape are verified by experimental approach and numerical simulation. The mathematical model of the relationship between the rock breaking strength and the bottom hole shape is established with a finite element method. Finally, this paper takes minimum rock-breaking energy consumption as the goal and introduces the "crown breaking work per revolution" as an objective function to optimize the bottom hole shape.