

عنوان مقاله:

Studying Effects of Cooling/Lubricating Fluids, Machining Parameters, and Rock Mechanical Properties on Specific Energy in Rock Drilling Process

محل انتشار:

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خلاصه مقاله:

Specific energy is a key indicator of drilling performance to consider in the feasibility and economic analyses of drilling projects. Any improvement in the specific energy of a drilling operation may reflect an improvement in the overall efficiency of drilling operations. This improvement can be achieved by delivering a suitable cooling lubricant into the drilling environment. The present study examines the mechanical characteristics of the drilled rock, the physical qualities of the cooling lubricant employed, and the drilling rig operational parameters related to the drilling-specific energy (DSE). To this end, seven rock samples (granite, marble, and travertine) were drilled using water and five other fluids as the cooling lubricants. A total of ۴۹۲ drilling experiments were conducted with a custom-designed and built laboratory-scale drilling rig on cuboid rock specimens. The univariate linear regression analysis of experimental results revealed a significant drop in DSE after using cooling lubricants instead of conventional cooling fluid (i.e. water). Under constant conditions in terms of mechanical properties of the rock, using Syncool with a concentration of ۱:۱۰۰ and soap water with a concentration of ۱:۱۲۰ instead of water led to ۳۴% and ۴۳% DSE reductions in the granite samples, ۴۸% and ۵۴% in the marble samples, and ۴۱% and ۵۰% in the travertine samples, respectively. These variations in specific energy suggest that the drilling efficiency and performance can be augmented using properly selected cooling lubricants.

کلمات کلیدی:

Drilling, Specific energy, cooling lubricant, drilling performance, Statistical Analysis

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