HARD-PARTICLE SIZE DISTRIBUTIONS FOR SOLID EXPLOSIVE INGREDIENTS

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ABSTRACT

Delay blasting in underground coal generates shock waves and rifting forces that damage charges remaining in the blast pattern. Damaged charges detonate poorly, raise fume toxicity and reduce coal breakage. Such circumstances could be prevented by using explosives resistant to cross-hole interaction damage. The design of rugged explosives is fraught with contradictory requirements, but tradeoffs related to hard-particle size characteristics prove useful. Hard particles, related voids or trapped bubbles represent reaction nucleation centers which strongly influence the performance of coal mine explosives.

Stacked sieve techniques were utilized to determine the hard particle size distributions for a wide range of insoluble solid ingredients. The results were represented by a distribution function with two constants chosen for optimal correlation via regression techniques. Theoretical formulae were developed to compute (without numerical integration) two statistics regarding size characteristics: the mean particle size and its root-mean-square (rms) deviation. Studying trends such as reaction-rate, gap-width, or incendivity versus particle size later helped us resolve more rugged workable compositions, and retrospectively demonstrated why the hard particle size characteristics were worthwhile.