

ROCKBREAKING CHARACTERISTICS OF VARIOUS MINING EXPLOSIVES IN SMALL DIAMETER HOLES

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ABSTRACT

The South African gold mining industry presently uses four different types of explosives in stope blasting. There is general agreement that the type of explosive has considerable effect on important blasting results such as the degree of rock fragmentation, the intensity of damage to surrounding rock, and the success of break-out at the toe of the hole.

This paper presents an analysis and comparison of rock breakage characteristics of four explosive types in small diameter drillhole (30 to 40 mm), and proposes the mechanisms responsible for the contrasting breakage effects of different explosives.

Fragmentation and rock damage were determined by sieving and by core drilling rock near blastholes. The breaking capacity of charges was established by investigating the bearing of the burden to hole diameter ratio on resulting socket (boot leg) lengths. In order to identify the mechanisms responsible for breakage differences, several aspects of explosive/rock interaction were quantified by the application of various instrumentation systems including high speed photography, dynamic strain and acceleration in rock near the blasthole, and the pressure histories of gases venting at the hole collar. A useful tool developed during the course of this work was a blasthole liner technique which enabled separation of breakage effects from shock and subsequent gas penetration breakage phases.

The findings of this work are in agreement with production blasting experience and provide useful guidance in the application of explosives in South African underground mining. They also have relevance to other types of blasting.