DIGISHOT® PRECISION MAKES MULTIPLE PRIMING WORK FOR OVERSIZE REDUCTION

To test the ability of the DigiShot® initiation system to deliver firing times ensuring independent detonation of the primary explosive at both ends of the column, a production blast was designed to test two techniques of initiation and determine the best method to use for fragmentation. One improved half of the blast was designed for both top and bottom primers to detonate simultaneously. The other half of the blast was programmed with a 25ms delay between the bottom and top priming unit firing times.

Observations of the blasted material after detonation showed a definite difference in overall fragmentation and oversize. The side of the blast with primers programmed to fire at the same time showed better fragmentation and reduced oversize. Mucking of the blasted material confirmed the initial observations made at the time of the blast event.

CAN THE ACCURACY OF ELECTRONIC DETONATORS IMPROVE FRAGMENTATION?

The concept of multiple priming was originally introduced to blasting as a means of insuring complete initiation of the explosive column in each blast hole. By using precise DigiShot detonators to instantaneously initiate firing multiple priming units or tracing the entire length of the explosive column with detonating cord, it was hoped that completed initiation of the column would enhance results.

Another common technique calls for the placement of primers at opposite ends of each explosive column with a delay between primers to have bottom-hole initiation with a back-up primer to insure complete column detonation. Some blasters tried using identical delays for both priming units, but the inaccuracy of the traditional pyrotechnic detonator made the results inconclusive.

COULD A QUARRY DOCUMENT THE EFFECT OF ACCURATE PRIMER DETONATION ON FRAGMENTATION?

By splitting the blast event in half and designing the primer firing sequence to have half the blast with instantaneous initiation and half with a 25ms delay between bottom and top primers, Dyno Nobel hoped to show the advantages of precision detonation and double priming each hole for instantaneous firing of both primer units.
Electronic Detonator Precision Allows Multiple Priming to Improve Fragmentation

Technology Applied

DIGISHOT FLEXIBILITY ALLOWS TESTING OF PRIMER TIMING INFLUENCE

The basic firing time (both surface delay and blast hole) for the blast was determined by using Signature Hole Analysis (SHA) seismic modeling to insure minimal off-site impact on neighboring properties. All holes were double primed with primers placed at opposite ends of the explosive columns.

Value Added

ALLOWING SIMULTANEOUS INITIATION OF TOP AND BOTTOM PRIMERS RESULTS IN REDUCED OVERSIZE AND BETTER FRAGMENTATION

The use of multiple priming with electronic detonators can be an expensive proposition. The DigiShot system allows the blaster to confirm that each detonator is functioning before giving the firing command which may reduce the need to double prime to insure that every explosive column will detonate.

Theories regarding the use of multiple priming to enhance blast results have been hard to test with conventional detonators. With the precision of the DigiShot detonator, it is possible to prime each end of the explosive column and have independent detonation of each priming unit. This enhances explosive performance in the areas where it is most needed, at the floor and toward the collar. The collision of the two detonation fronts in the explosive column has been thought to aid fragmentation as well.

While this has not been full proven, the explosive column detonates in half of the normal time, allowing energy release into the rock to improve.

The results of this test blast served to confirm that multiple priming with electronic detonators can provide a fragmentation result that adds additional value to the use of electronic detonators. Down-stream production costs can be reduced and more than compensate for the cost of using multiple electronic detonators.

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