Improving Cast and Saving Time and Money for Big Mines with Electronic Detonator Precision

Project Summary

DIGISHOT® PRECISION IMPROVES EFFICIENCY OF CASTING OPERATIONS FOR LARGE COAL MINES, LEADS TO BIG SAVINGS

DigiShot® electronic detonators were trialed to confirm that the precision timing provided by the system correlates to improved explosive performance and an associated increase in effective cast.

The benefit of increased cast volumes is substantial cost savings from reduced material re-handling, reduced dozer push times and reduced dragline digging times to more quickly and efficiently expose coal for extraction.

Results of cast blast in large western U.S. coal mines have shown a significant increase in effective cast, resulting in cost savings that more than compensated for the cost of using a value-added electronic initiation system.

Project Goals

PRECISE TIMING CAN IMPROVE EFFECTIVE CAST VOLUMES

Timing sequences resulting in maximized casts had been quantified previously. By exchanging traditional pyrotechnic detonators with the DigiShot electronic initiation system, expected benefits included precise hole firing times, reduced cutoffs and better utilization of explosive energy. A more efficient cast to final is anticipated as a result of the better utilization of chemical explosive energy in the blast.

Background

EFFICIENT OVERBURDEN REMOVAL CRITICAL FOR COAL EXTRACTION

To increase coal mine productivity, cast blasting uses chemical explosive energy to reduce the need for the mechanical energy used to remove overburden on top of coal deposits. While this technique has been refined to maximize the amount of material moved by the blast, limitations in blasting technology have long been tied to a limitation in the amount of material casted. The inherent inaccuracies associated with any pyrotechnic delay system can result in errors in hole sequencing leading to added confinement, hole interruption and other factors that have traditionally limited further advances in cast efficiency.

Technology Applied

DIGISHOT PLUS ALLOWS FOR FLARG BLASTS WITH ELECTGRONIC PRECISION

The DigiShot Plus system allows for blasts utilizing up to 1800 detonators. As cast blasts gain efficiency with the size of the detonation, the ability to maximize the blast size provides another means to improve cast to final volumes.
Multiple priming is employed to insure complete explosive column detonation. The capacity to initiate multiple priming units in each hole instantaneously provides added effectiveness to the overall blast event by ensuring more explosive energy is used to generate and displace the overburden material.

Additionally, the ability to recheck detonators right up to the firing time allows the blast crew to evaluate every hole prior to the blast. Slumping of product can sometimes cause a loss of the detonator down-line, resulting in unfired boosters and detonators in the muck. Multiple priming insured that each hole has a means of detonating the explosive column as designed.

Value Added

PRECISION INITIATION LEADS TO BETTER EXPLOSIVE PERFORMANCE AND SIGNIFICANT GAINS IN CAST BLASTING OPERATIONS

For most sizeable coal mines, time is money. The quicker coal can be uncovered from the overburden, the faster it can be extracted and shipped to market. The use of cast blasting has been used for many years as the workhorse for overburden removal in large mines.

With the introduction of the DigiShot electronic initiation system, coal mines have a new tool for maximizing cast blast efficiency.

Because of the long delays typically used for cast blasting, the electronic detonator provides assurance that holes fire in sequence; something that could not be guaranteed with a traditional pyrotechnic detonator. Instantaneously energizing all of the detonators eliminates potential cutoff problems that can negatively impact any blast event and create safety issues.

The results speak for themselves: better casts, reduced costs and safer blasts related to unstable highwalls and improve the cast to final material.

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