Controlling Vibration Damage
The Telfer Test

Project Summary

GOOD VIBES AND BAD

Whether Joshua's trumpet blasts brought the walls of Jericho down is still subject to scientific debate, but the ability of HotShot® electronic initiation to control damaging low frequency vibration has been proven beyond doubt.

The HotShot ability to maintain the integrity of highwalls was demonstrated in a recent test at Newcrest's Telfer gold mine.

A test comparison of Dyno Nobel's high precision electronic detonators and traditional shocktube detonators at the mine yielded good vibrations for HotShot. As well as demonstrating a reduction in vibration levels, the test also proved this more sophisticated blasting system can increase dig rates, allow expansion of burden and spacing dimensions, while maintaining productivity.

Key results with HotShot showed:

- Maximum vibration readings were generally lower than NONEL®
- High vibration readings (above 50% of max) were lower and fewer in number
- Uniformity in vibration across the entire blast
- Ability to control the vibration frequencies, minimizing the low frequencies that threaten final walls, which is not possible with NONEL due to pyrotechnic scatter.

Background

CONSTANT BLAST DESIGN PARAMETERS FOR ELECTRONIC AND NONEL INITIATION

Telfer, Australia's largest gold mine, has both a Main Dome open cut and Telfer Deeps underground mine exploiting a gold/copper orebody that extends to a depth of 1.3kms beneath the Western Australian desert.

Telfer was Newcrest's major asset when the company came into existence in 1991 and is now one of several large mines that this leading international gold company operates. Newcrest is one of the world's lowest cost gold producers, Australia's largest, and a global top 10 mining company.

The Telfer mine, in Spinifex country - 450 kilometers inland from Port Hedland, was commissioned in 2004-05 and began commercial production in February 2005 from the open pit. The first underground production started in March 2006 as a sublevel cave. The total production in 2007-08 was 590,217 ounces of gold and 26,771 tons of copper.

Blast design parameters for the comparison test at Telfer were determined by Newcrest Engineering to suit the geology. Parameters including initiation timing were kept constant for both shots.

Project Goals

REDUCED VIBRATION LEVELS AND IMPROVED DIG RATES WERE EXPECTED

The expected benefits from electronic detonators for Telfer identified prior to the trial were:

- A reduction in vibration to maintain the integrity of their highwalls
- An increase in dig rates using existing parameters or
- An increase in burden and spacing dimensions while maintaining productivity.

DYNO
Dyno Nobel

Groundbreaking Performance

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To keep the comparison simple, the nominal timing for the initial HotShot blast was kept exactly the same as for NONEL, thereby limiting any performance improvements to the precision of the electronics.

Technology Applied

SMARTSHOT, THE FULLY PROGRAMMABLE ELECTRONIC DETONATOR SYSTEM ADDS BENEFITS

While HotShot was used in this trial, Dyno Nobel did introduce the fully programmable electronic detonator system, SmartShot™, which adds to all the HotShot benefits. SmartShot expands the number of detonators to 2,400, provides for full programmability of each detonator and allows for delay assignment manually of each detonator, or automatically for strings of detonators. Delay assignment can occur from a single location.

The SmartShot system makes the tie-in simpler and enables the operator to fire the blast remotely from up to 3,000 meters away (line-of-sight).

In addition, SmartShot has significant safety and security features built in. Unlike non-electronic systems it requires unique digital signals and passwords not only to fire the shot but to activate the individual detonators. In addition, unlike electric detonators, SmartShot detonator circuitry protects from over voltage, electrostatic discharge and electromagnetic pulse. The detonators are also protected from mobile phone and other RF signals.

Value Added

PRECISELY CONTROLLED FIRING OFFERS IMMEDIATE REDUCTION IN VIBRATION

The electronic microchip that controls initiation timing of a SmartShot detonator provides an accuracy of ± 1 millisecond. This allows single hole firing, controlling the Maximum Instantaneous Charge (MIC), resulting in reduced vibration levels.

In contrast, pyrotechnic delay detonators are not consistently capable of this due to their inherent scatter. This precise timing can minimize back break and the blast energy that is transferred through vibration to the walls.

Video and geophone vibration monitoring of the blast validated the expected benefits.

The Telfer test also demonstrated how electronic detonation allowed pattern expansion without impacting dig rates. The benefits include reductions in drilling, explosives and accessories.

And just think, Joshua and the Israelites would have saved six days marching around Jericho.