CASE STUDY

INCREASED BLAST SIZE LEADS TO 50% BLASTING CYCLE EFFICIENCY IMPROVEMENT AT CRACOW

PROJECT SUMMARY

LARGER BLASTS, REDUCED DILUTION AND ENHANCED SAFETY

Electronic detonation has transformed production efficiency at Newcrest's underground Cracow Mine in central Queensland. In 2005, blasting at the steeply dipping epithermal gold and silver mine was being managed conventionally, until the mine struck a geo-technically sensitive stope. If pyrotechnic detonators were used, the stability of the stope's 10 meter span could be compromised.

Dyno Nobel's solution was to use its electronic detonator HotShot® to mass blast and extract the ore. The results were outstanding. Increased accuracy allowed firing of much larger blasts. With greater control of the firing direction, the company was able to reverse fire the whole stope in one mass blast, throwing the ore away from the waste backfill. The production benefits were tangible and the system reduced exposure of charge crews to the hazards of working next to a stope void.

BACKGROUND

A JOINT VENTURE MINING HIGH-GRADE GOLD

Cracow is owned by a joint venture between Newcrest Mining (70%) and Sedimentary Holdings (30%). Gold production began in November 2004. The high-grade gold mineralization lies in the Royal, Crown and Sovereign shoots 100 to 600 meters underground. The Royal is approximately 350 meters along strike and the Crown and Sovereign approximately 300 meters along strike. While there may be abrupt changes in horizontal thickness and grade, the ore bodies' width averages 5 meters.

More than 110,000 ounces of gold were produced at Cracow in its first year of operation at a grade of 11.57 grams per tonne and a cash cost of $307 per ounce*.

*Newcrest 2006 annual report

PROJECT GOALS

HIGH LEVELS OF SAFETY AND SUSTAINED PRODUCTION

The overall goal in 2005 was to sustain production while maintaining high safety standards. As conventional blasting at the 10 meter span would expose charge crews to several charging sequences adjacent to a stope void, electronic detonators were selected to mass blast the stope, instead of blasting in sections. Working closely with Newcrest's technical team, Dyno Nobel developed a 20-ring, 96-hole design to minimize ground vibration while maintaining fragmentation and hanging wall and footwall conditions.

The initial shot increased fragmentation, reduced vibrations, reduced dilution, and improved efficiency in hanging-wall and footwall conditions.

The mine's practice was to fire blasts into an open stope, which was filled with waste backfill. As a result, ore could be diluted or not fully recovered, if thrown into the waste while firing.

In September 2006, a refinement to the established mining practice was trialed. Electronic detonators allowed firing the winze up to a 5 meter cap, with all rings being

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fired in a single blast. This enabled the mine to change the direction of firing away from the waste backfill, into the void created during the firing of the winze and slot holes. Greater accuracy allowed short delays between blastholes, improving fragmentation and minimizing risk of cut-offs.

TECHNOLOGY APPLIED

USING THE SMARTSHOT SYSTEM

Today, the mine uses the SmartShot™ electronic detonator system, which enables design and implementation of advanced blast designs. Detonators cannot fire unless the system's coded signal provides the correct instruction and voltage. Electronic blasts are fired through pre-installed cable.

Prior to SmartShot's introduction in 2007, the mine used the HotShot system, which is suitable for small to medium blasts and can fire up to 600 detonators.

The Cracow mine was the first to use HotShot detonators underground. The mine now uses electronic detonators for all production stope blasting. Better timing control allows operations to improve fragmentation and throw and to reduce vibration.

VALUE ADDED

GREATER BLAST CONTROL AND BETTER EFFICIENCY

According to Newcrest mine superintendent at Cracow, Nick Strong, greater blast control using SmartShot led to significantly increased efficiency.

"SmartShot gives us great confidence, as there is no scatter and the firing sequence is guaranteed. Electronic detonation made mass blasting possible, when pyrotechnic detonators didn't have enough range. We were able to increase time available for the blast from about 4 seconds to 18 and to cast broken dirt in the direction of the loader, which greatly improved productivity."

"SmartShot's accuracy allowed us to boost size of firings, decrease re-entry and design firing to minimize cut-off risk. Electronics gave us full flexibility in timing, allowing us to avoid cut-offs in closely spaced ring holes by separating the time by only a few milliseconds, rather than the full 25ms offered by non-electronic detonators."

"Increased blast size led to a 50 per cent improvement in blasting cycle efficiency," Strong said.

Results:

- Reduced exposure to the hazards associated with working adjacent to voids. Mass blasting means that there are no open voids while charging.
- Improved conventional/tele-remote bogging ratio from 10/90 to 50/50.
- Charging time per stope reduced from approximately 7 x 3-hour cycles to two cycles of 2 and 7 hours (9 hours).
- Zero re-drills from blast damage.
- Fragmentation improved and oversize significantly reduced.
- Detonator inventory halved.
- Greatly improved safety profile from reduced.