Improved Fragmentation Results in Higher Productivity for Newcrest

Project Summary

BLASTING 150M UP-HOLES TO IMPROVE INITIAL CAVING DYNAMICS

When Newcrest approached Dyno Nobel with the idea of blasting a 150m long vertical up-hole, the enormity of the project was quickly realised. Conventional loading techniques and products were not suitable for such an undertaking. So a period of design and innovation ensued. During this development period, specifically designed products such as TITAN® BPC, custom made SmartShot® detonators and innovative pumping solutions were devised, put into action and rigorously tested.

The project scope was very specific, with the requirement for an explosive that can maintain sensitivity and have a constant density throughout the blast hole being a critical component. Meeting these requirements, combined with having control over communication with the initiation system and blast timing, meant that the Blast Preconditioning (BPC) holes could be blasted safely.

This culminated in the successful firing of a single trial hole containing almost 3,300kg of explosive in June 2011. Following almost 18 months of planning, multiple pumping and blasting trials, the first BPC production blast of two holes was fired successfully on the undercut level in October 2011. Multiple holes have been fired instantaneously since that time.

Background

AUSTRALIA'S LARGEST GOLD PRODUCER HAS SOME UNIQUE CHALLENGES

Newcrest's Cadia Valley Operations are located approximately 250 kilometres west of Sydney and approximately 20 kilometres from the regional centre of Orange. Newcrest is Australia's largest gold producer and one the world's top 5 gold miners. The Cadia East resource, located adjacent to the Cadia Hill open pit, is a massive low grade gold-copper porphyry deposit covered by up to 200m of overburden. The system is up to 600m wide and extends to 1.9km below the surface.

The mining method employed at the site is Panel Caving which is a natural caving method that uses ground stresses, rock structures and gravity to break the rock. The Cadia East mine is the first panel cave in Australia and the deepest panel cave in the world with the extraction level lying approximately 1,200m below the ground surface. Ore is extracted using a mechanised fleet and delivered to the surface through an underground conveying system for processing.

Project Goals

IMPROVING ADVANCE AND PRODUCTIVITY WHILST MINIMISING DAMAGE

Panel and Block Caving operations can experience periods of low cave advance and poor productivity when caving is initiated due to limited time for in-situ crushing resulting in sub optimal fragmentation. Blast Preconditioning of the Block Cave is designed to engineer the rock mass to produce material of a suitable block size and assist in the initial propagation of the cave.

Protecting mine infrastructure was also of great importance. Given that the Blast Preconditioning holes were fired prior to blasting the undercut level, minimising damage to the drives was paramount. Consequently, all blasts had to be loaded and fired with minimal deviation from design.

DYNO
Dyno Nobel

Groundbreaking Performance®

Improved Fragmentation Results in Higher Productivity for Newcrest

Technology Applied

DEVELOPMENT OF TITAN BPC AND A PROCESS TO LOAD AND FIRE

For Newcrest's panel cave project to be a success it was vital for Dyno Nobel to develop a new explosive and delivery system that would be capable of loading such holes.

A specifically designed emulsion based explosive, Titan BPC, was developed for this application. The requirements of the explosive were for it to be robust, easy to handle, able to maintain sensitivity when exposed to high head pressures and have a high Velocity of Detonation (VoD). Prior to the use of Titan BPC underground, these characteristics were proven in open pit trials.

In order to combat the high head pressures associated with a 150m high column of explosive, re-engineering of the delivery system was a prerequisite. The Dyno Nobel Engineering and Operatons teams worked closely to devise a new design. Following a series of trials, a modified Mobile Processing Unit (MPU) was shown to be capable of consistently loading Titan BPC into a 150 metre long up-hole.

Having almost 3,300kg of Titan BPC in the hole with a 20m grout plug at the collar meant that a reliable and robust initiation system was required.

Custom made SmartShot detonators were manufactured to ensure accurate initiation together with the benefit of 2-way communication to determine the detonator status in-hole. Lead lengths of up to 160 metres were employed to reach the toe of the hole. The SmartShot system performed extremely well in tough conditions with the detonators surviving intense pressures (up to 30 bar) in the hole and

being initiated without issue – sometimes numerous days after being loaded.

Value Added

IMPROVED FRAGMENTATION RESULTING IN HIGHER PRODUCTIVITY

Firing the BPC holes fully confined produces significant fracturing in the rock mass adjacent to the blast hole. These fractures assist in the comminution of the rock mass, improving caving dynamics particularly at the commencement of the caving process. The finer fragmentation of the ore body from the BPC process should result in decreased down time of the drawpoints which in turn could increase production rates, and ultimately assist to ensure that cave propagation meets or exceeds the customer's expectations.

Damage from blasting to backs and drives has been minimal. Accordingly, the requirement for ground support re-work has decreased and there were safe working conditions on the undercut level directly below where the BPC holes have been fired.

Continued, close collaboration with Newcrest ensured that this project was a success. Today, groups of four BPC blast holes are fired together, with this occurring several times per month.

DynoConsult
A Division of Dyno Nobel