SmartShot® Initiation System and DynoConsult Expertise Delivers Record Mass Blast

Project Summary

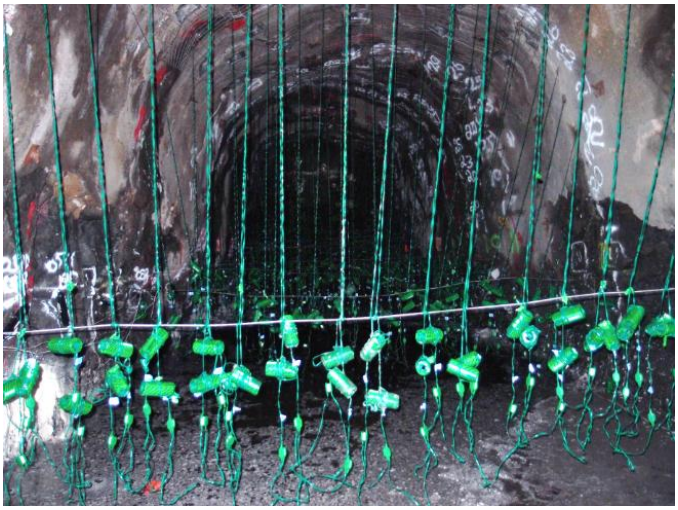
MASS BLAST REQUIRED FOR MINE TO TRANSITION FROM OPEN PIT TO UNDERGROUND

To successfully transition from an Open Pit operation to an underground sub-level cave it was identified that this mine needed to complete a complex extraction sequence for the first two production sub-levels. To further complicate the situation the following factors had to be considered:

- The mining sequence was essentially locked in by completed development;
- The presence of reactive ground limited product sleep time;
- Instability of the pit wall prevented completion of the final open pit shell;
- Ground conditions and seismicity were associated with regional fault slip;
- Limited void was available for blasting;
- The ground was making water and the wet season loomed;
- Blast vibration, over-pressure and fumes had the potential to affect major mine infrastructure and delay re-entry.

In order to undertake such a complex blasting project the Principal engaged the services of DynoConsult ® to:

- Develop a suitable blasting solution covering all aspects of the transition;
- Provide both technical and operational support for the duration of the project;
- Project manage all tasks associated with the charging and firing of the blast. The transition blast was one of the largest known firings conducted in an Australian underground metalliferous mine. After forty one days of charging, the blast was successfully initiated via wireless communication link utilising Dyno Nobel's SmartShot initiation system. No direct blast damage was sustained to surface or underground infrastructure. As a result of this firing, a large section of the inclined crown pillar between the pit and underground mine was fragmented and formed an ore blanket for air blast management and prevention of early waste dilution.



Background

CHALLENGING CONDITIONS IN THE OPEN PIT

The mine has been in production since 1996. The pit wall had a history of instability and failures due to intersecting faults and an aggressive wall angle. During the final stages of open pit mining, geotechnical monitoring and analysis identified potential impacts to underground workings. Consequently, the decision was made to leave some material behind to confine dominant faults and structures as risk mitigation to prevent premature wall failure. This significantly increased the volume of unmined material, identified as "transition" ore, that remained for underground extraction. Comprising approximately 2 Mt of relatively high grade ore, this material formed an inclined crown pillar and barrier that prevented cave progression to the wall.

Project Goals

COMPLEX SOLUTION REQUIRED TO MAINTAIN MINE PRODUCTION

In simplistic terms, the mine's goal was to mass fire the transition block ensuring the mine could safely transition from open pit to underground sub level cave without impacting on mine production performance.

DYNO Dyno Nobel

Groundbreaking Performance®

SmartShot® Initiation System assists with Improving Stope Productivity

DynoConsult's specific goal was to provide the Principal with a complete technical blasting solution to achieve the project objectives. The challenging part was achieving this with all the associated complexities of a project this large subject to the identified constraints.

Technology Applied

DYNOCONSULT EXPERTISE WITH SMARTSHOT SYSTEM CAPABILITY AND T7000SX

DynoConsult were able to deliver a technical solution that:

- Provided the greatest volume and coverage of pre-firing void for the mass blast
- Maintained void stability, wall integrity and did not break out into the overlying pit, as that would result in lower mine level ventilation impacts due to short-circuiting
- Maximised stability to allow for continued safe access to the mass blast area via access drives
- Optimised the timing sequence with multi-directional firing fronts to reduce blast induced ground vibration and resultant damage to surrounding infrastructure and development

In order to achieve the necessary sleep times for charging a blast of this size in reactive ground, it was essential to utilise T7000SX emulsion. Isothermal testing with T7000SX confirmed an extended sleep time of 42 days – theoretically more than enough time to get the shot away.

The complex nature of this blast required an electronic initiation system to provide precision timing and the capability of being successfully initiated remotely from the surface. The initiation solution for the job was Dyno Nobel's SmartShot System – with wireless initiation from the surface coupled with the synchronisation of four SmartShot Bench Boxes and over 4,500 Smartshot detonators.

Value Added

SMARTSHOT AND DYNOCONSULT DELIVER THE RIGHT SOLUTION

DynoConsult successfully delivered a technical solution for one of the world's largest underground blasts. The complex blast design was developed involving a multidirectional firing sequence, consideration for vibration management, limited available void (18%), reactive ground and extended sleep times. The degree of difficulty of the blast was further increased due to charging and blasting in both geotechnically challenging ground and wet conditions.

The final outcome of this project included:

- Successful initiation of the transition blast within the allowable sleep time limit and prior to damaging seasonal rainfalls and significant wall failure in the pit.
- No immediate post blast damage to the rock mass and ground support in underground access drives and excavations.
- Air blast and concussion were successfully minimised.
- The design maximum instantaneous charge (MIC) of 273kg was achieved through single hole timing, that minimised blast vibration. The entire mass firing was achieved within the firing system time limit of 20,000ms.
- No blast damage was incurred to mine infrastructure.
- The mine was fully re-entered within 16 hours of firing, which was ahead of expectations.

There is no doubt that the transition from an open pit to underground SLC operation was a challenging and complex undertaking. The successful completion of the transition blast heralds the next phase of underground ore production, allowing the operation to continue to be productive, profitable and safe into the next decade.

DynoConsult
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