CASE STUDY

Post-Condition Blasting, improved safety and productivity enabled only by WebGen™ - Wireless Electronic Blasting Freeport Indonesia – DMLZ Underground Mine

Site Profile

PT. Freeport Indonesia Mine Site, located in the remote highland in the province of Papua, Indonesia. Out of five Underground mines, the Deep Mill Level Zone (DMLZ) is applying Block Caving method. The ore production started in 2015 with current production rate in this area of around 80,000tpd.

Figure 1. Location of PT. Freeport Indonesia

Situation

The Deep Mill Level Zone (DMLZ) Underground is a challenging ore body, with a high Rock Mass Rating and a difficult digging process of the cave material. Large Hanging rocks at the draw-point, make it difficult to achieve production targets.

Presently, over 80 blockages occur in the production level, per shift. This mine area is in the ramp up stage and at full production the blockages could more than triple. Extra stresses caused by the competent rock give rise to seismic events that have caused access problems. The mine has a hydraulic fracturing program to help as well as considering blast pre-conditioning.

Technical Solution

Pre-conditioning has been used at other block caves to help initiate caves and improve the productivity of the cave draw. A technique to increase the effectiveness of conditioning was trialed. The undercut blast was carried out before the conditioning blasting above it. The area where the conditioning blasting is taking place is undercut, reducing the confinement, and allowing gravity to assist to improve the conditioning effect. This is the first global trial of this Post-Conditioning method.

The method is enabled by WebGen™, Orica's wireless initiation system, as there is no need to have a physical connection with the conditioning holes to be blasted.

A new up hole stemming system was also developed. The stemming is non shrinking, quick curing, low temperature, and high strength. The up-hole stemming process was streamlined by Minova to allow the charging and stemming processes to be completed in 2 days, a reduction of over 5 days on previous methods. The stemming lengths covered the undercut zone up to 15m.

Depending on site conditions, these blasts can be pre or post conditioning to maximise benefits to the production and safety of the people and equipment.

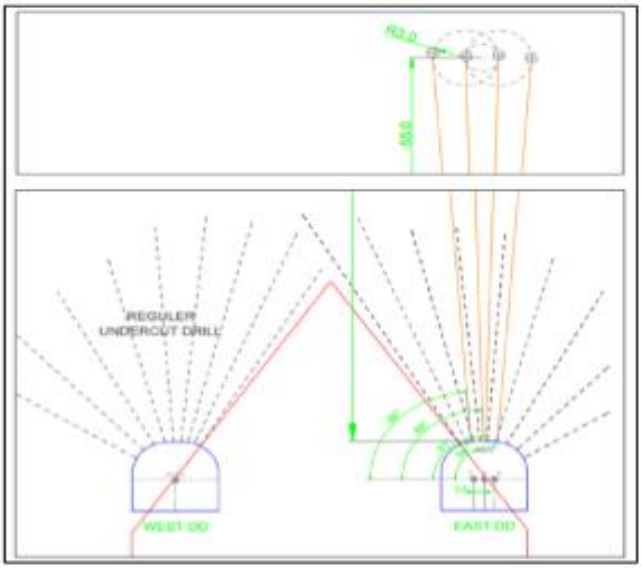

Figure 2. Conditioning blast design (Orange Lines with dotted lines being undercut) at DMLZ.

To support the trail several de-risking activities were undertaken including pressure monitoring, signal surveys, predictive modelling of signal strength, collaborative blast designs and stemming trials.

Results

Three rings have been fired during the trial, results are currently inconclusive as a reduction in hang ups is unable to be measured presently, the Joint Team expects a significant reduction with an increase in tonnes per shift.

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Orica has prepared the value analysis of the trial, refer to Table 1. Target prediction of the application is a 30% reduction of hang ups with estimated baseline of 30 hang-ups/shift.

Hang Ups per shift	Hang Ups Reduction 40%	35%	30%	25%
45	$ 24,1	$ 20,6	$ 17,1	$ 13,7
40	$ 21,0	$ 17,9	$ 14,8	$ 11,8
35	$ 17,9	$ 15,2	$ 12,5	$ 9,8
30	$ 14,8	$ 12,5	$ 10,2	$ 7,9
25	$ 11,8	$ 9,8	$ 7,9	$ 6,0
20	$ 8,7	$ 7,1	$ 5,6	$ 4,1

Table 1. Sensitivity Analysis (M$)

The intangible benefits include removing people and equipment from working under the seismically active areas of the cave. The loading, stemming, and firing activities were carried out safely and established a new benchmark for the conditioning application.

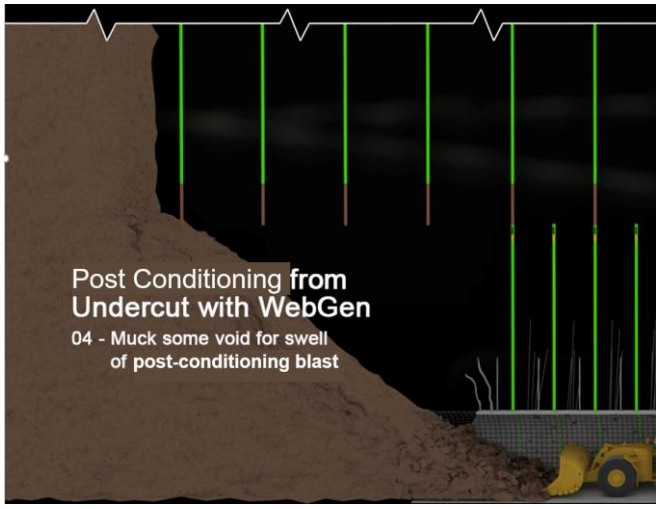

Figure 3. Post Undercut Conditioning Concept

Conclusion

Freeport Engineering Department and Orica will continuously work together to continue to apply the method at DLMZ and to measure the impact of this world first application for both reduction of hang up and increased production.

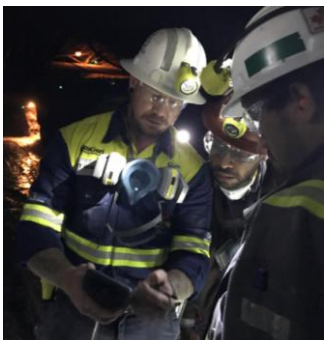

Figure 4. WebGen™ Blast Process

Figure 5. WebGen Freeport/Orica Firing Team

Testimonial

The following is the response from PT.Freeport Indonesia management. DMLZ Engineering Manager Mr. Rifki Bastiawarman said:

"*With the potential damage of drill hole, the wireless detonator is one solution for long hole drill in our post conditional blasting. It will help to reduce secondary breaking in production level*"

Acknowledgements

Thanks to the Freeport Engineering and Management teams along with Orica's Global Operation and Technical Service teams for their support.

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