

CASE STUDY

Reducing mine development using WebGen™

Glencore Ernest Henry Mine, Australia

Site Profile

The Ernest Henry mine (EHM) is a copper-gold mine located 38km north-east of Cloncurry in north-west Queensland, Australia. The mine produces 6.8Mtpa of ore from a chalcopyrite-rich breccia pipe plunging at approximately 45 degrees using the sublevel cave (SLC) mining methodology.

Production from the SLC was conventionally started from blind uphole rises at the end of slot drives. Baseline performance for rise and widening firings were achieving on average 81% of design height and width. Development of these slot drives required prioritisation as they needed to be extracted before the level can achieve full production. Investigations to replace these slot drives with independent ore drives proved uneconomic when extending the drives to minimise ore loss.

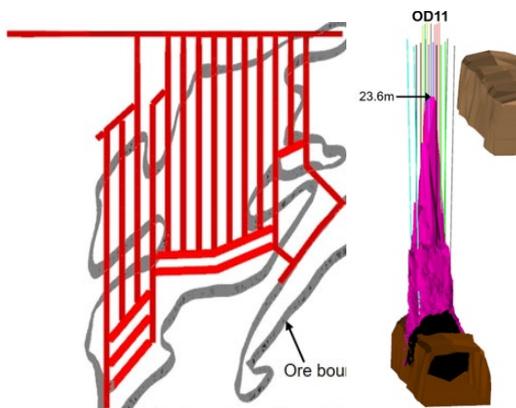


Figure 1 Level with slot drives, & Typical baseline slot widening result

The Situation

Following a successful trial of Orica's WebGen™ wireless initiation system in 2017, EHM recognised that existing design philosophies were not fully capitalising on the benefits of the wireless detonator technology. Orica was engaged to review operational practices with the EHM Production Engineers to investigate ways to use wireless initiation to deliver step change operational benefits to the mine.

Technical Solutions

A novel design was proposed that combined the rise and slot widening blasts into a single design using current design principles. WebGen™ was used to pre-charge the widening shot. This enabled the rise to be fired conventionally and mucked first with the widening shot fired secondary leveraging the height and void of the rise to obtain the required width. This proposed design allowed for the removal of the slot drives. Initial trials were similar to previous rise firings achieving 80% height but with unfavourable width profiles. A substantial design review was conducted, and a secondary trial undertaken.

The rise design review used the Lovitt Success Factor for initial design changes followed by a technical review using 1st principles. These reviews resulted in the following changes - from a 4.0 x 4.0m blind uphole rise to a 4.0 x 2.8m rise, rotated 180 degrees, reduced true burden in the centre stripping holes, removing angled holes, changing toe primer locations, slower timing for stripping holes, and adding an extra three hole stripping ring.

The Result

The first rotated design achieved a 25.4m peak in the rise from 25m design and very good width. At the time of this case study 12 rises have been fired and have averaged 95% of design height.



Figure 2 Step change performance following continuous improvement application of WebGen™ in rise/slot widening blasts

The rise accounts for 2.8m of the 15m width required to commence SLC production. The WebGen™ pre-



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charged widening shot has consistently produced positive void scans throughout this trial.

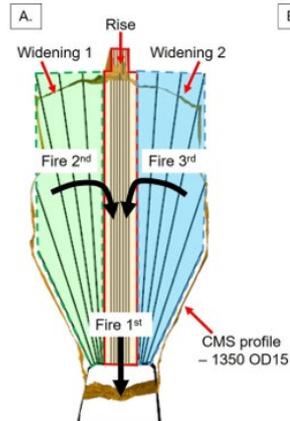


Figure 3 WebGen™ application in slot widening shot

The successful application of a single rise / slot widening blasting regime to create independent drives has enabled EHM to eliminate slot drives. This has reduced lateral development by an average of 150m or 4.5% per level.

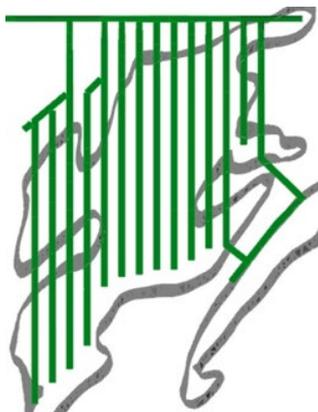


Figure 4 Level design without slot drives reduced development by 150m on average per level

Importantly though, historic rise and widening shots recovered approximately 75% of insitu design volume. In contrast, WebGen™ enabled rise and widening designs have demonstrated recovery of approximately 95% of insitu tonnes. As an example, an additional 4.2m in rise height achieved by WebGen™ enabled

designs increased primary ore recovery across a level by 75,000 tonnes.

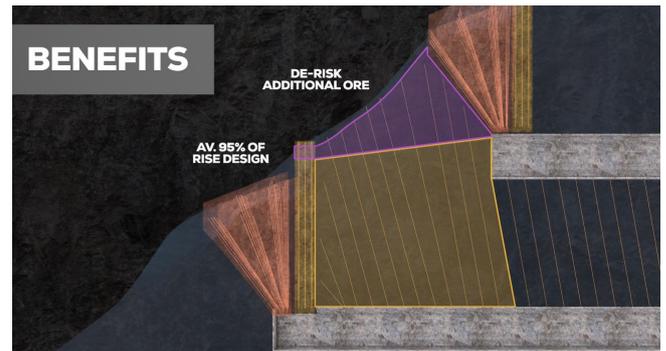


Figure 5 Additional rise height can increase primary recovery by 75,000 tonnes

Other direct outcomes of removing slot drives have been:

- the reduction of drive intersections from 24 to 2,
- removing complex equipment interactions,
- 17% reduction in priority development scheduling,
- reduced critical path schedule,
- reduced ground support requirements,
- reduced and simpler ventilation requirements,
- adapts easily to changing ore boundaries, and
- simpler ring design by removing complex firing shapes such as at intersections.

Using WebGen™ initiation system incurs a significantly higher cost than its non-electric equivalent. Despite these costs and excluding the additional recovered metal our cost analysis has confirmed a positive net return.

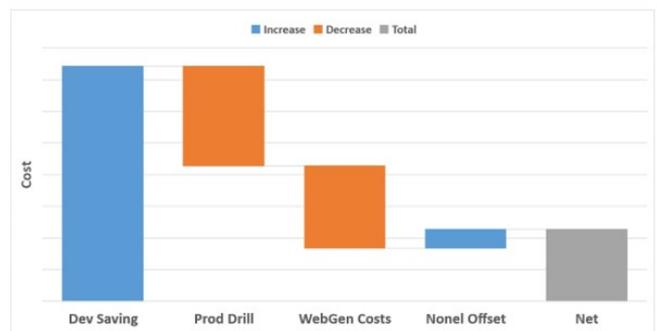


Figure 6 Cost analysis for elimination of slots with WebGen™



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Testimonial

“By using WebGen on site, we have seen a significant safety improvement of operators not being involved in unsafe areas. The overall benefit for Ernest Henry is not only the reduced development and the financial reduction we have seen, it is also the de-risking of additional ore that we are also gaining with this trial. Working with Orica is a very rewarding experience to identify, execute and discover opportunities and continuous improvement value in the operation”.

Michael Hawtin – Lead Resource Engineer, Ernest Henry Mining.

Reference

Reduced Development through improved Rise and Widening Firings using Orica WebGen™ at Ernest Henry Mine. *M Hawtin, J Say, P Cann, and L Carlon*

Acknowledgements

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