

# Controlling Overbreak in Development Mining

## MMG Golden Grove, Australia

### Site Profile



Figure 1: Golden Grove Underground Mine

Golden Grove is an underground and open pit base and precious metal mine owned by Minerals and Metals Group (MMG). Golden Grove is comprised of the Scuddles and Gossan Hill mines and surface processing operations. It is located Western Australia's Midwest, approximately 450 kilometres north-east of Perth and 280 kilometres east of Geraldton.

MMG Golden Grove produces concentrates of zinc, copper and high precious metals (HPM) which are exported to smelters in China, Korea, Japan, India and Thailand via the Port of Geraldton.

The Scuddles underground mine (to be known as Scuddles) uses the sub-level open stoping method of mining and operates to a depth of 1000 meters below the surface.

MMG Golden Grove manage the operation, but employ a mining contractor, GBF to conduct development and production mining at Scuddles.

### The Situation

The mine is currently extending the depth of its operations beyond 1000m. At these depths they are noticing that the quality of the rock is worsening and the foliation and alteration is increasing in complexity.

The fractured and jointed ground conditions at Scuddles have led to an increase in overbreak in the development drives, variation between the 'as designed' volume and the 'as blasted' volumes of some drives exceeded 30%\*.

*\* Data sourced during benchmarking phase*

MMG Golden Grove management recognized that such high levels of overbreak were having a significant cost impact to the operation and have been working the GBF team to find solutions to reduce this level of overbreak.

### Technical Solutions

Orica suggested a demonstration of Subtek™ Control for development mining, and MMG Golden Grove agreed. A trial plan was drafted that included pre-trial benchmarking to establish the current development system performance.

It was agreed by GBF and Orica that all scheduled headings over the two week trial period would be charged with Subtek™ Control while the Orica Technical Team was on site to do the trial and provide support. Careful post blast monitoring of all headings was done using Siro vision (a 3D camera) to capture the post blast headings.

Necessary minor modifications to an existing Hypercharge™ Drive charging unit were made and the appropriate gassing agent was manufactured. A different coloured dye was introduced to distinguish the Subtek™ Control product from the Subtek™ Charge emulsion and the demonstration proceeded to completion.



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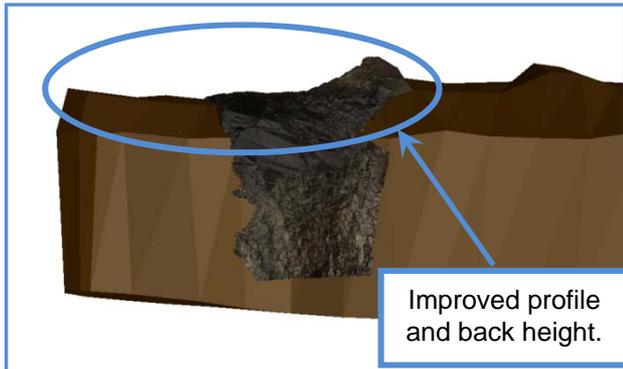


Figure 2: Subtek™ Control against design profile.

### The Result

Drive profile data was processed using Surpac, and results showed a significant reduction in overbreak enabling the Orica Technical Team to graphically demonstrate the advantage of using Subtek™ Control in the development headings.

Overbreak was reduced to as low as 5.0%. Using the survey pick-ups, Siro vision and design shapes, Orica Technical Services team used design software to slice and calculate the overbreak after excavation.

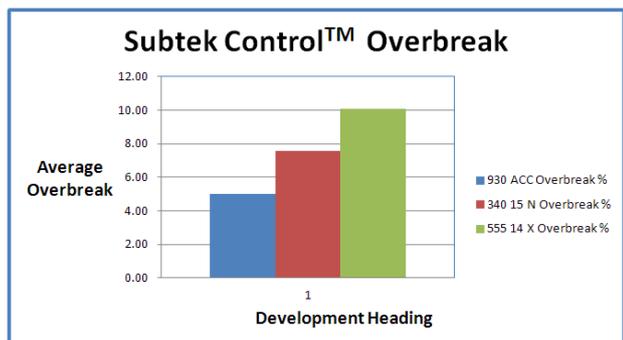


Figure 3: Overbreak Results

Subtek™ Control generated the following average results over the 10 headings:

- A 50% reduction in the average overbreak when compared to historical data.
- A 50% reduction in scaling time.
- Positive feedback about Subtek™ Control and its benefits from the GBF staff involved in the trial.



Figure 4: Post Blasted Profile improvement.

### Benefits

Using Subtek™ Control at Scuddles reduced the volume of overbreak by reducing the blast induced radial fracturing which is responsible for overbreak and poor back conditions.

These results translated into:

- A reduction in surface area to be mechanically scaled, ventilated and maintained;
- Reduction in the amount of broken rock to be bogged and hauled.
- A reduction in the meshing and bolting times;
- The potential to increase development rates;
- Reduction of explosives cost when compared to using packaged perimeter products.

### Acknowledgements

Orica would like to extend its gratitude to Robin Goddard, MMG Underground Manager - Scuddles, Greg Winder, MMG Alternate Underground Manager - Scuddles and his staff. Bruce Milne, Project Manager – GBF along with site Foremans & Supervisors.

Special thank you to the GBF operators for their support of the project to achieve a great result.



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