CASE STUDY

Accelerating Production with WebGen™ enabled Mine Schedule Flexibility (MSF)

Newmont Boddington, Western Australia.

Site Profile

Newmont Boddington is a large open cut gold and copper mine located 120 km from Perth, WA. It is one of Australia's largest gold mines with an annual gold production of 670,000 ounces in 2020.

Newmont Boddington operates two main pits and a smaller satellite pit with truck and shovel, in a triple stack bench configuration. The mine is extending access to the orebody at depth by widening the pits with cutbacks.

The Situation

Cutback mining introduces bottlenecks when the load and haul fleet finish at one end of the bench while the drill and blast team are establishing the next bench down. This point leads to lower productivity and periods of poor machine utilisation due to limited access and available areas to drill.

Figure 1 - Production constraints limit areas for blasthole drilling.

Technical Solutions

WebGen™ is a wireless initiating system that fires blastholes using a signal transmitted through air, rock and water. Being truly wireless, all explosives are located within blastholes in the ground. Eliminating physical connections opens a whole new range of possibilities, including Mine Schedule Flexibility (MSF). MSF describes a method of work that turns loaded blasts into temporary haul roads. The technique maintains parallel mining and drilling activities, ultimately increasing the vertical advance of open cut mines.

A Hazard Study process was used to identify, verify, and test a control framework for the application. The hazards identified include;

- High forces exerted by heavy equipment tramming or impact.
- High temperature due to a vehicle fire.
- Magnetic field from high current trailing cables.
- Interaction with explosives during haul road construction or maintenance
- Adjacent operations, including drilling or excavating into haul road.
- Over-excavation leading to reduced stemming or burden when blasting.

Detailed theoretical and practical investigations identified that the first three potential hazards are not credible.

- Pressure is rapidly attenuated by the ground; therefore, heavy equipment forces, tyre explosions and rockfall impacts will not have any effect.[1]
- Heat is rapidly attenuated by the ground; therefore, an intense vehicle fire will not have any effect.[1]
- The magnetic field induced by high current trailing cables is too weak and does not carry the correct digital code to corrupt or prematurely fire a WebGen™ primer.

[1] No effect when wireless primers and the bulk explosives are a minimum three metres below the surface.

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The remaining hazards are deemed manageable to an acceptably low risk with the following Control Framework.

Table 1 - MSF Critical Control Framework

Control	Description
Priming Practice	Minimum primer depth of 3 metres. Record primer location unless stem height greater than 3 metres. No dig warning zones recorded if primer location less than 3 metres.
Blast Site Demarcation	Blasts identified in the mine traffic management plan. Unique MSF temporary haul road demarcation visible day and night. Maintain the existing stand-off for adjacent operations.
Excavating Practice	Excavation depth limited to stem height only. Hole collars identified by surveying. Exclusion zone implemented as defined in misfire procedure including the use of a spotter. Confirmation blast exclusion zone has not been compromised by excavation.

Orica and Newmont worked together over several years to develop the concept of a temporary haul road. With the ability to safely drive over the loaded blast pattern, Newmont identified a large opportunity, capitalising on MSF through their mine planning process. It was proposed that the planning team could de-bottleneck operations through drilling and loading of areas that would normally not be accessible due to the mining fleet access requirements.

The Result

In September 2022 Orica and Newmont successfully and safely demonstrated the temporary haul road in an operating mine for the first time, globally.

The first MSF blast at Newmont Boddington was S05L060504, consisting of 932 blast holes, extending from the highwall to pit edge. A 1.8 m high windrow was placed to split the blast into two sections, Part A and Part B.

Figure 2 - Part A, drilled and loading.

Blast hole loading began in Part A. During this time, Part B was used as a haul road. Once Part A was loaded, drill collars were graded, and the blast pattern was converted to a temporary haul road. The MSF temporary haul road maintained the production circuit while Part B was drilled and loaded.

The temporary haul road remained open to all mining traffic for eight days until access was no longer required and both Part A and B were fired as one production blast.

The largest equipment to traverse the temporary haul road during the eight days were the Caterpillar 793F and 793D autonomous haul fleet, the Caterpillar 24H grader, D11 dozer and 994 wheel loader as well as Epiroc DML and D65 drill rigs.

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Figure 3 - Part B, drilling adjacent to MSF temporary haul road

Third party modelling of Newmont Boddington's long-term plan suggest MSF will increase the utilisation of drills, trucks and shovels, ultimately increasing the mining rate by 30 days in a typical 9-month period at Boddington.

Testimonial

"WebGen technology is going to be a game changer for the mining industry. It's not only going to make it much safer because you're reducing the exposure to geotechnical risks and narrow working areas risks, having no space constraint is a massive advantage for recovery, productivity, and optimisation of the pit."

Rabindra Singh – Newmont Boddington Senior Manager Mining.

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