

Inverse box hole blasting at Elandsrand

AEL Mining Services recently partnered with EBJ Mining Construction to successfully execute mechanised, inverse box hole blasting at Harmony Gold's Elandsrand mine in South Africa – increasing safety and production

Inverse box hole blasting has been successfully used in platinum mining. In conventional box hole development in gold mining applications, an incline raise is used to create an orepass by manually drilling down the host rock to advance to the orebody.

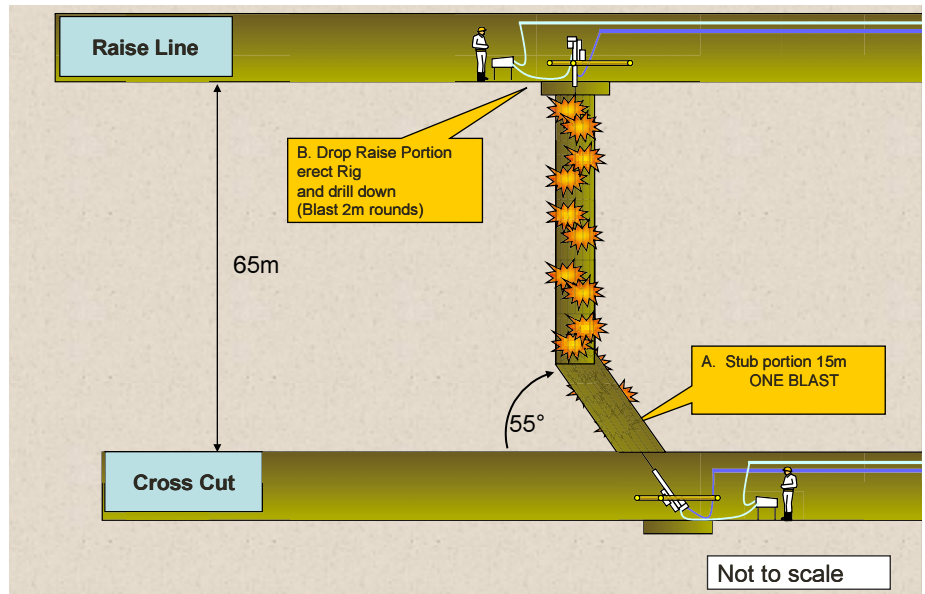
Eugene Fouche, acting Mine Manager at Elandsrand, comments, "In the past, we used long hole mechanical (raise boring) and short hole conventional development. With the increase in the reef development rate, this method proved to be slow and labour intensive, resulting in a backlog of box holes. We changed to a mechanised method, combining inverse box holes with drop raising.

"This new mechanised method", adds Fouche, "entails drilling the orepass from the bottom of the rock upwards at an angle using an automatic drilling machine. This minimises the number of people physically involved in the drilling and blasting of the ore passes, resulting in increased safety of personnel."

Inverse box hole drilling also ensures a more accurate holing point without fracturing the rock, thereby reducing the chances of rock slips and rock-related injuries. "The current advance rate for conventional box holing is on average 1.2 m/d, compared to inverse blasting of 2 m/d," says Fouche.

Elandsrand mine has converted to the DigiShot range of electronic initiation systems supplied by AEL's sister company, DetNet, which eliminates the need for blast operators; putting more men out of harm's way. Electronic detonators also ensure that the timing and precision of each blast is accurate.

Dyno Nobel reports that the accurate timing provided by DigiShot can achieve a variety of benefits ranging from better fragmentation to improved crusher throughput to fewer disturbances to neighbours of an operation resulting from decreased Peak Particle Velocity (PPV) and/or improved frequencies.



The inverse drop raise method

Hole drilled for inverse drop raising



It features easy to use, menu-driven software and minimal on-bench components – just the electronic DigiShot detonator (in the blasthole) and a two-wire busline on the pattern. There is no delay timing input on the bench. This makes the blast loading and hookup process easier and minimises errors. All delay timing is defined on the DigiShot Blast Box so the pattern and timing sequence can be handled in a safe, off-bench location. Timing can even be managed, for convenience, day(s) before the actual blast.

The hole is blasted with a single blast up to 15 m from the bottom up. The remainder of the orepass is blasted from the top of the raise. A homogenous emulsion with glutinous properties is used to charge the hole, and ensure that the explosives do not fall out of the predrilled hole when initiating the blast.

Johan Fourie, Regional Manager at AEL comments on the blasting of the inverse drop raise hole: "With the traditional box hole development method, it would take approximately 12 days to advance 15 m before loading



Showing the precision of drilling at the rock face of the raise

and blasting the hole. This process could take longer in some of the older gold mines where reef exposure is minimal. With inverse drop raising, we are able to drill the whole length of the tunnel in six days and then blast on the seventh day, reducing the turnaround time from 12 to seven days”.

The Elandsrand mine straddles both Gauteng and North West Province, and is located near the town of Carletonville. The mine was acquired by Harmony in January 2001 and comprises a twin vertical and sub-vertical shaft system. The Elandsrand metallurgical plant treats ore from the Elandsrand shaft. The Elandsrand deepening project, which came into production in 2003, involved the development of a new mine beneath the original mine. The project targets the southern, deeper portion of the higher-grade Ventersdorp Contact Reef pay shoot at depths of between 3,000 and 3,600 m. The project was re-started by Harmony in 2001 following the acquisition of Elandsrand. Harmony has calculated a mine life of 28 years, through to 2037, producing around 7.39 Moz of gold. It has an average reserve grade of 6.27 g/t Au.

Good progress continues to be made with the development and the build-up of production on the Elandsrand deepening project. The winder and headgear for the No 3 backfill shaft were installed and commissioned in May 2009 and sinking started. This shaft will supply feed and return chilled water to 109 and 113 levels. Both 22 kV transformers have been installed and commissioned at 100 level, as had two of eight bulk air coolers.

Commissioning of the second settler dam will begin once the dam wall and suction piping on 115 level has been completed. Progress was also made with the installation of the refrigeration plant pipes and the ventilation system.

On February 23, Harmony Gold announced that this historic mining operation “will take the best from its past and work towards a safe and productive future under a new identity and name.” The Elandsrand mine, which dates back to 1968, is undergoing a significant cultural shift and correspondingly, is changing its name to Kusasaletu, a Zulu word meaning *our future*.

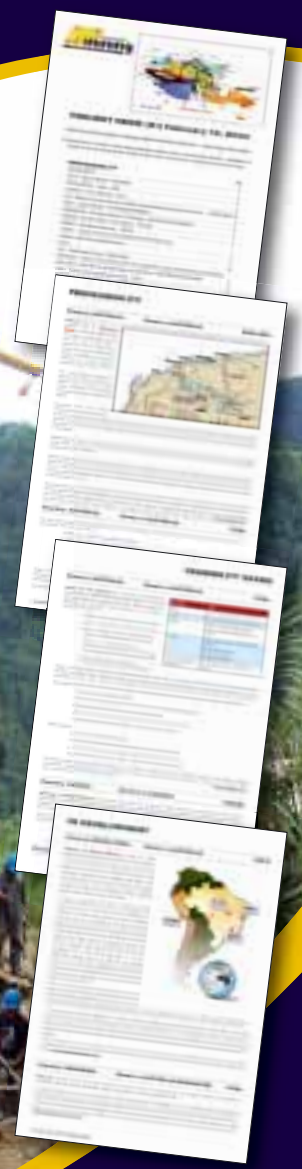
Elandsrand, which employs over 5,000 people, has an estimated life of mine of 28 years, which means operations could continue to the year 2037. Alwyn Pretorius, COO: North Region, is very clear in this approach: “This new identity is more than a renaming exercise. It is about creating a safe and productive work culture within a fundamentally caring environment, in which the people of Kusasaletu can develop and thrive. We hold in our hands the potential for great hope and prosperity - we must use it well.” **IM**

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