ABSTRACT

AngloGold Ashanti's Mponeng Gold Mine, is considered a deep level mine, with stope panels having an inherent risk of face bursts, due to the high face stress conditions encountered. As a face burst control measure, face perpendicular preconditioning of stope faces has been successfully implemented over the last 15 years.

The initial preconditioning assessment done on the mine, was conducted at now considered shallow levels, with the mine having gone deeper. With the operation mining deeper faces and the change in stress levels, it was therefore appropriate to assess whether the current preconditioning standard is still effective.

During the initial preconditioning technique development project, one of the successful assessment tools used was Ground Penetrating Radar (GPR) profiling. The tool can be applied to determine the effectiveness of preconditioning by determining the extent and intensity of fracturing ahead of the panel face. The project therefore used GPR profiling.

Following GPR profiling of 10 preconditioned sites on the mine, and analyses of the results obtained, the following conclusions were made:

- The mine's fracture depth averages 5.0m which is above the 3.5m value shown on the GPR scan done during the initial preconditioning assessment project.
- The Mponeng mine preconditioning standard is adequate to achieve the required fracture depth for effective preconditioning, therefore no need to amend the preconditioning hole length and spacing as used on the mine.
- The type of footwall does affect the depth of fracturing obtained, with the shale footwall panels achieving deeper fracturing than the quartzite footwall panels.
- Depth of fracturing has been shown to increase with increase in Energy Release Rate (ERR) values for the quartzite footwall sites. Therefore deeper fracturing ahead of the face can be expected as the stope matures.
- The expected rate of depth of fracture increase with stope maturity is 0.17m/ERR (MJ/m^2), for quartzite footwall panels.

- The depth of fracturing for shale footwall sites indicates a decrease in fracture depth with an increase in ERR values. There is however a reduced confidence in this analysis since only 3 data values were used.
- The GPR results were able to show the effect of preconditioning hole burden spacing on the fracturing. The burden spacing of 3.0m as used at Mponeng, is the effective spacing for achieving a continuous fracture profile ahead of the faces.
- There is a general increase in fracture depth when preconditioning hole burden spacing is reduced, however this benefit is insignificant at a range of 6cm increase in fracture depth for 0.5m preconditioning burden reduction. Burden spacing reduction does not significantly increase fracture depth, however it can be used to ensure a high percentage (up to 100%) probability of continuous fracture achievement.
- Where hole spacing is reduced to less than the 3.0m mine standard, the depth of fracturing is increased, and inversely wider preconditioning burden causes the depth of fracturing to be reduced.