



New technology increases drilling efficiency

In underground mining, blast-hole deviation is measured as the extent to which the toe-point (or break-through point) of a blast-hole deviates from the plan.

Blast-hole accuracy is widely recognised to be key to optimal blasts, defined as minimised dilution, maximised recovery and optimised fragmentation size.

This is why most underground drill and blast operations have targets in place regarding acceptable levels of deviation, commonly referred to as 'tolerance'.

Holes drilled are classified as either 'within' or 'outside' tolerance, with holes sufficiently outside tolerance potentially negatively impacting blasting performance. Australian industry

best practice tolerance is considered to be a 2 per cent deviation over the length of the blast-hole.

Alignment error is the primary cause of blast-hole deviation, along with collar error (due to collar location error) and in-hole deviation (commonly due to ground conditions and operator skill/judgement during drilling).

Consistently inaccurate drilling can lead to sub-optimal blasting outcomes and as a result, poor stope performance. This includes reduced ore recovery rates, over/under-break, dilution

and lost drilling productivity as a result of re-drills - increasing stope cycle time.

Minnovare's Production Optimiser system is an innovative new drill and blast technology that is designed to address these issues and increase drilling efficiency and productivity for mine operators. Minnovare's solution offers a systematic approach that eliminates error in the process.

Applicable to all makes and models of production rigs, the system eliminates up to 70 per cent of error at the toe by removing multiple variables from the existing setup process that result in inaccurate and inconsistent drilling such as: laser line mark-up, alignment to the laser lines, drill leveling, multiple inclinometer calibration, operator error, wear and slack in the drill.

According to Minnovare, the Production Optimiser eliminates a number of variables in the production drilling process that result in inaccurate and inconsistent outcomes.

Reducing these variables results in highly accurate, consistent drilling, which in turn delivers less re-work, reduced ore-loss (under-break) due to inaccurate drilling and decreased costs associated with re-access and dilution/waste. The simplified process also leads to an increase in stope turnover.

Mick Beilby, Director at Minnovare, stated: "It has been encouraging to see how far the industry has moved, with increased understanding that the primary cause of blast-hole deviation is as a result of the process that occurs before the bit penetrates the rock face."

"Since we first launched Minnovare's Production Optimiser system in 2018 it has proven to significantly reduce blast hole drilling deviation and simplify the rig set-up process in underground mines, resulting in numerous flow-on benefits; reduced re-drills, reduced dilution, reduced bridging (improved recovery), and greater all-round visibility and accountability across drill and blast performance. We are pleased with the rapid uptake we have seen in Australia, with the Production Optimiser adopted on one in every three long hole drills in Australia."

SURVEY CONDUCTED ACROSS AUSTRALIAN UNDERGROUND MINE SITES

Between 2019 and 2020, Minnovare conducted an extensive study across 17 underground hard rock operations in Australia. This study spanned 17 sites, with four different commodities being mined - gold (16), zinc (1), copper (2) and nickel (1). Three of the operations are mining more than one commodity on-site - resulting in the discrepancy in total sites.

All but one of the mines have narrow-vein ore bodies with the primary mining method being long-hole stoping (13), followed by open stoping (3), and the remaining mine conducting sub-level stoping.

Across the sites, a total of 2,408 holes were drilled using existing processes and then later surveyed. The average surveyed length of all holes was 24 metres. The average number of holes drilled and surveyed at each site, was 142. 13 sites used a Boom Rig while four used a Horse-Shoe Rig.

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The findings of the study are summarised below:

Inaccurate drilling: Across 17 sites, average toe deviation was 5.8 per cent. Over the average hole length (24 metres), this equates to an error of 1.4 metres. Average toe deviation is therefore well outside industry 'best practice'.

Sources of error: The majority of toe deviation (60 per cent) was due to alignment error - indicating flaws in the existing process for setting up the drill were primarily to blame for overall inaccuracy. Around 4 per cent of the error at the toe was due to collaring error and 36 per cent due to in-hole deviation.

Inconsistent drilling: The standard deviation in alignment error was 2.7 per cent across drill types, indicating highly variable set up accuracy irrespective of rig type.

The result: Inaccurate and inconsistent drilling can result in poor stope performance.

PRODUCTION OPTIMISER DELIVERS RESULTS FOR CRACOW MINE

The Cracow Gold Mine, located approximately 500 kilometres north-west of Brisbane, was owned and operated by Evolution Mining from November 2011 until June 2020.

In early 2017, the mine was experiencing issues with blast-hole deviation and subsequent impacts on dilution and productivity. The operator contacted Minnovare to see if they had any solutions to these issues and the Production Optimiser was implemented at the site between June and December 2017.

Immediate results were witnessed. With existing processes, only 20 per cent of holes surveyed recorded toe points within the ± 300 mm tolerance blast-hole deviation. Yet with the Production Optimiser, the operator was able to achieve greater drilling accuracy, with 52 per cent of holes drilled to within 2 per cent (± 300 mm) tolerance at the toe/breakthrough.

Minnovare also estimated that if the Production Optimiser was applied at the mine over a full 12 month period, it would result in AU\$8.2 million of additional ore recovered* with AU\$4.5 million less spent on wasted costs of haulage and processing of diluted ore*.