

“ Minnovare’s Production Optimiser™ technology reduced our blast-hole deviation significantly; giving us the confidence to reduce our minimum mining width in very narrow vein areas - utilising a ‘ZIPPER’ drill pattern in place of the widely used ‘DICE-5’ pattern on approximately 10% of stopes.

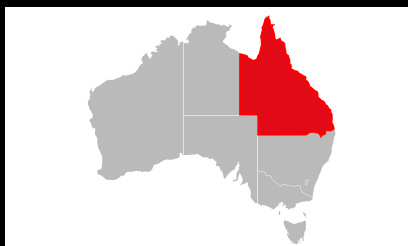
Successful extraction of the first two ZIPPER stopes recorded 25% less planned dilution. Maintained across all applicable stopes, that’s 10,000tns less waste per year, and AUD\$1M (USD\$0.7M) less spent on haulage & processing. ”

**Phil Jones, Technical Services Superintendent.**  
Evolution Mining, Cracow Gold Mine



# EVOLUTION MINING, CRACOW

CRACOW GOLD MINE is located 500km North-West of Brisbane, Queensland. Minnovare’s Production Optimiser technology was implemented in early 2018, leading to an immediate reduction in blast-hole deviation and subsequent 62% reduction in dilution during the first six months. With new-found confidence in drilling accuracy, Cracow began trialling ambitious new drill and blast patterns - with impressive early results. Phil Jones talks us through this ongoing case study.



LOCATION: **QUEENSLAND, AUSTRALIA**

YEAR: **2018**

INDUSTRY: **UNDERGROUND MINING**

CLIENT: **EVOLUTION MINING**

FOCUS: **LONG-HOLE PRODUCTION DRILLING**

RIG TYPE: **FLOATING ROOM**

SOLUTION: **PRODUCTION OPTIMISER SYSTEM**

## ISSUES IDENTIFIED ON SITE

**Phil Jones:** “ We knew that inaccurate drilling was one of the primary contributors to the issues we were experiencing with dilution and stope misfires, but we also knew there were adjustments we could make to our blasts to further improve results.

Accurate drilling is critical when experimenting with more ambitious drill and blast designs – otherwise the risk of it going wrong outweighs any benefit. Since Minnovare’s Production Optimiser technology was implemented in early 2018, the accuracy of our drilling had improved substantially - with the number of holes drilled to within tolerance at toe / breakthrough improving by 160%.

This allowed us to look at implementing new drill and blast designs that reduced the minimum stope width in areas where the vein is less than 1m, reducing



planned dilution and associated costs. In addition, a number of marginal, lower grade areas that were previously uneconomic to mine could now be brought into reserves and mined at a later date.

Average ore body widths at Cracow have decreased over time. Our traditional ‘DICE-5’ patterns were originally designed for seams approx. 2m (6.5ft) in width. Recently discovered orebodies have numerous areas where the vein width is 1m (3.2ft) or less, leading to excessive dilution and potentially uneconomical stopes utilising DICE-5 designs.”

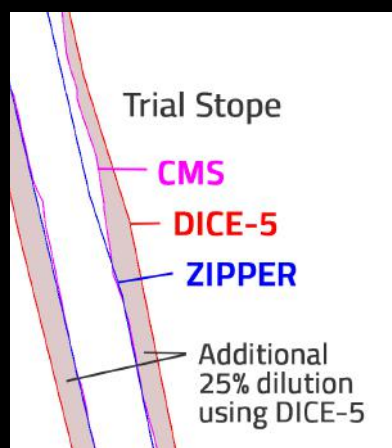
## THE SOLUTION

In late 2018, Cracow engineers began experimenting with a new 'ZIPPER' blast pattern to replace the traditional DICE-5 pattern on very narrow vein stopes. The ZIPPER pattern reduced the total number of holes and the average stope width design to 1.3m (4.2ft), compared to 2.2m (7.2ft) using the DICE-5.

## THE RESULTS

"Two trial stopes were drilled and blasted using the new ZIPPER pattern. One of these stopes recorded 495 tonnes less dilution compared to what would have been mined using a DICE-5 pattern. This represents about a **25% reduction in waste tonnes** for this stope - a significant saving. We estimate that 10% of our stope tonnes going forward can now be ZIPPER instead of DICE-5.

At 390,000 stoping tonnes per year, a similar **25% reduction equates to approximately 10,000 tonnes** less waste/low grade ore that would otherwise have been hauled and processed. Which at current cost, works out to approximately **AUD\$1M (USD\$0.7M) a year.**"

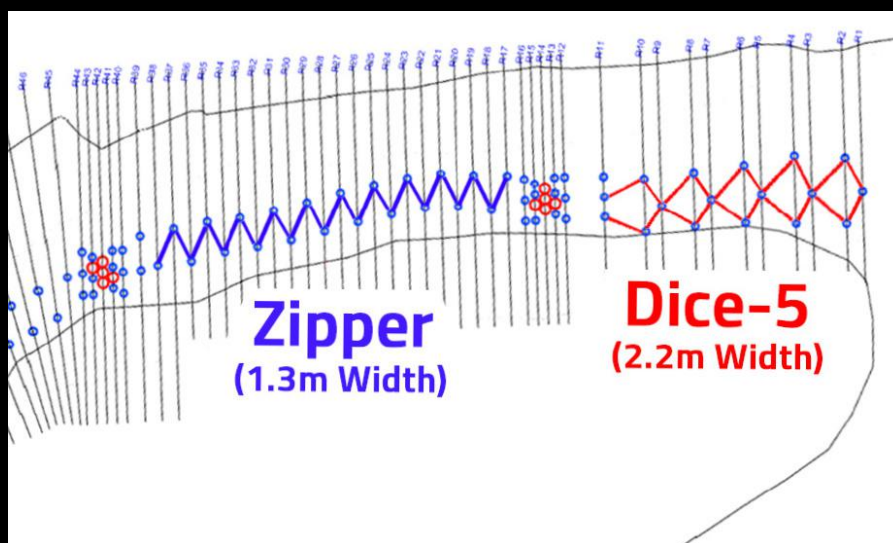


## IMPLICATIONS & FUTURE DEVELOPMENTS

"The increase in drilling accuracy due to the new Production Optimiser technology has allowed us to address our unplanned dilution. Now that we have confidence in our drilling, we can experiment even further with our blast design patterns to reduce planned dilution - not just on the most narrow vein stopes, but all stopes.

Aside from the reduction in waste, greater drilling accuracy has led to previously uneconomical stopes becoming profitable, opening up additional mining fronts. This will allow us to produce more gold, with the same workforce and equipment, whilst reducing our average cost of production."

A comprehensive free **Whitepaper** co-authored by Evolution Mining is also available from the Minnovare website, providing further detail on this case study.



**REDUCED BLASTHOLE  
DEVIATION  
(IMPROVED  
ACCURACY)**

= MORE RELIABLE  
BLAST RESULTS  
= AMBITIOUS NEW  
BLAST PATTERNS

**25% LESS DILUTION  
(WASTE) ON  
ZIPPER STOPES**

**EQUIVALENT TO  
10,000 TNS  
LESS WASTE ORE**

**AUD\$1M  
LESS SPENT ON  
HAULAGE AND  
PROCESSING**

**PRODUCTION™  
OPTIMISER**

