

Understanding the Impact of Blast-Hole Deviation

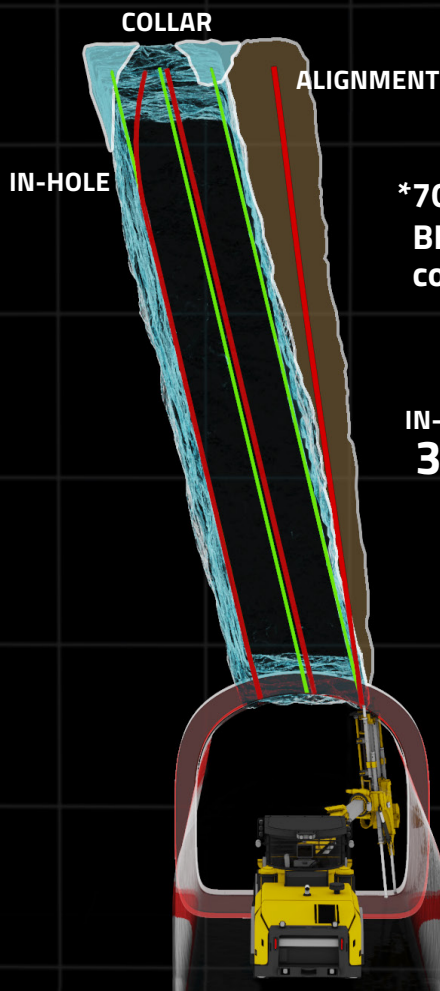
Poor Blasting Outcomes:

Reduced Recovery

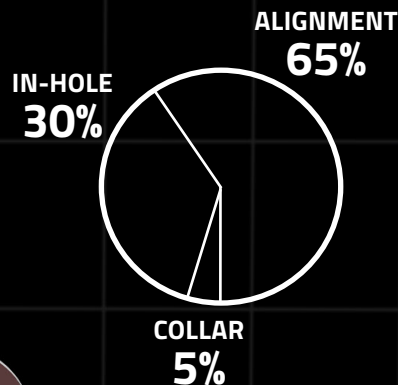
Unplanned Dilution

Re-Drills

Slower Stope Cycle



*70% of errors occur
BEFORE drilling
commences



*Results from a
Minnovare 1,000 hole
study, across 10
underground mines.

What are the Causes?

Geology

Drilling Error

Blasting Error

What is Causing Drilling Error?

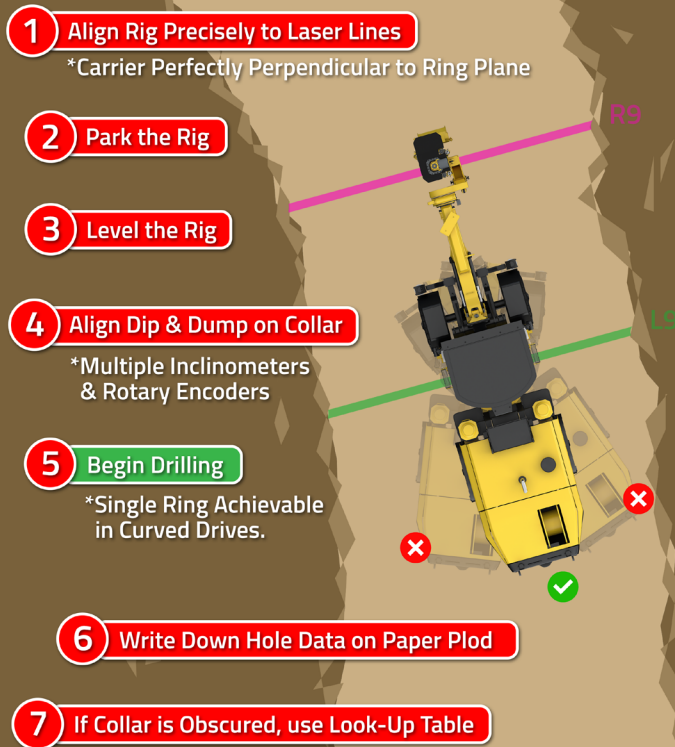
Onboard (Rig) Sensors

Survey Mark-Up Error

Rig Positioning Error

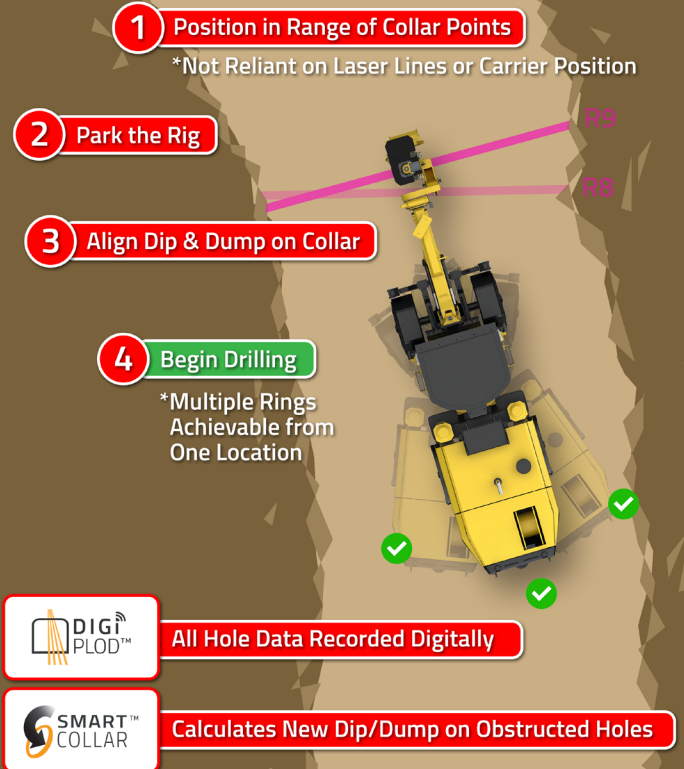
Operator Error

Let's Examine the Process >



Existing Rig Setup Process:

- ❶ **Alignment Accuracy is Reliant on Numerous Tolerances.**
 - How well the laser lines are marked?
 - How well the rig is aligned to the laser lines?
 - How well the rig is leveled?
 - Multiple inclinometer calibration.
 - Multiple rotary encoder calibration.
 - Wear and slack in the rig affects accuracy.
- ❷ **Excess Time Spent Setting Up**
 - Achieving accurate set up takes time due to multiple tolerances = less time spent drilling.
- ❸ **Multiple Sensor System**
 - Sensors can break.
 - Calibration drifts.
 - Many wires that can be damaged by rock fall.
- ❹ **Limited Accountability**
 - Drillers incentivised on production meters rather than quality meters - best practice is not always followed.
 - No record keeping of initial alignment.
 - No accountability for how well the rig is set up.
 - Drill plans and plods are all paper based.
 - No option to re-calculate a new dip and dump when collars need to be offset.



Production Optimiser™ Process

- ❶ **Alignment Accuracy is Reliant on a Single Tolerance**
 - Between the Production Optimiser sensor, and the rod.
 - System references true north.
 - No reliance on laser line mark-up.
 - No reliance on rig leveling.
- ❷ **Minimal Time spent Setting Up**
 - Simplified setup = more time spent drilling and a faster stope cycle time.
- ❸ **Reliable Technology/System**
 - Wireless communication - less likely to get damaged.
 - System is self calibrating.
- ❹ **Greater Accountability**
 - Guarantees consistency between drillers – the system will not allow an “out of tolerance setup” to be saved.
 - Records all setup and drilling data against the driller/rig.
 - Digitised drill plans and plods – simplifying data transfer to and from mine systems (**Digi-Plan / Digi-Plod**).



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