COPROD for Simba

Rock drilling system for underground production drilling

Epiroc

Double your drill length, speed, and precision

With a strong track record from surface drilling, we are now bringing the successful COPROD system to the Simba production drill rig family. Compared to traditional drilling methods, such as tophammer and ITH, COPROD offers up to 3 times higher penetration rate with excellent precision.

By separating the rotation and percussion in dual drill strings, power is transferred straight from the rock drill to the drill bit with jointless inner rods, allowing for very efficient and consistent drilling along the full hole length.

COPROD for Simba is compatible with Simba E60 S and E70 S. Except for the COPROD options, these rigs come equipped with all the latest features and benefits found in other Simba models.

Main benefits

Quality - Excellent hole accuracy in combination with faster drilling provide huge downstream value benefits

Sustainability - Less blast induced damages, increased ore recovery and lower dilution enable optimization and a more sustainable mining operation

Productivity - Up to 3 times faster drilling compared to ITH and Top Hammer drilling

COPROD for Simba

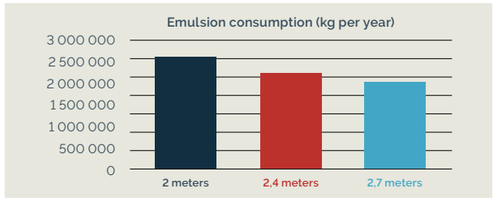
Right from the start
Drilling is the critical first step in the underground mining process flow. With enhanced hole accuracy and increased speed, COPROD for Simba unlocks significant opportunities for optimization and downstream benefits, including:
• better fragmentation
• less dilution
• improved ore recovery
and much more!

Towards the future of mining
Additionally, COPROD for Simba opens new possibilities in mine design, potentially lowering cost per tonne by introducing innovations such as double benches and larger draw bells. By pushing existing limitations, you can accelerate towards the mine of the future!

Reduced consumption of explosives

Increased hole spacing and burden
- Leading to reduced consumption of explosives, impacting both costs and CO_2 emissions
- Requires less drilling

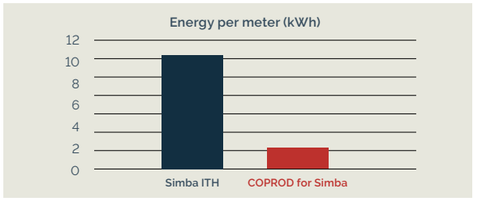
Reducing costs per tonne by up to 26%. New mine design possibilities with increased scale (double benches) could create significant cost savings due to less mine development.



Reduced energy consumption

80% lower energy consumption compared to ITH drilling.

Reduced drilling costs, due to
- No additional compressed air system needed
- Reduced maintenance
- Running costs for electricity or diesel



The cost of dilution

Traditional drilling vs COPROD for Simba. Example mine with 6 000 000 tonnes of annual production. Ore grade 0,94% Copper price of 9 000 USD per tonne.

	Waste rock	Ore	Ore grade	Copper
Traditional drilling with 15% dilution	900 000	5 100 000	0,80%	48 000
COPROD for Simba with 10% dilution	600 000	5 400 000	0,85%	51 000

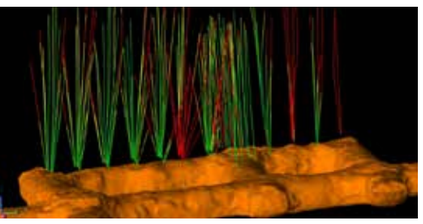
Results:

3 000 tonnes more
copper mined annually

27 000 000 USD
added value

+ Automation

Being able to drill longer and straighter holes with a reliable drilling system like COPROD, sets the prerequisites for autonomous drilling of a full ring. This combined with the Powerbit X drill bit and E-tramming functionality, enables the operator to stay out of hazardous areas while simultaneously increase productivity in the mining operation.



+ Real mine coordinates

Epiroc's well-renowned Rig Control System together with Total station navigation enables the usage of real mine coordinates, which facilitates the communication between the drill rig and the back office. This makes reconciliation easier and contributes to live work elimination, since the surveyor does not have do any painting/mark up of the face.

+ Long holes win in the long run

Economy is always an important challenge in mining operations. COPROD is the solution for those who are ready to take the next leap forward with the profitability of their mining operations and to think long term.
COPROD can lower your cost compared to ITH or Top Hammer when including productivity benefits. COPROD also open doors to larger scale of mining and new alternative mine designs thanks to longer holes with excellent precision.
In the long run, the ultimate goal is to lower the cost per tonne of your mining operations.

How does it work?

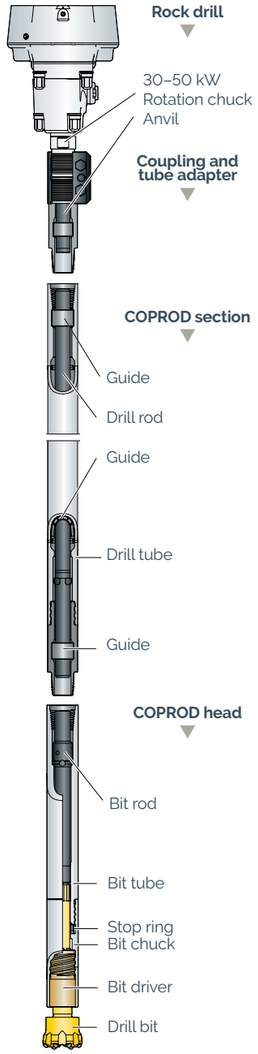


Figure 1, COPROD drilling system.

COPROD combines a threaded drill tube with an unthreaded drill rod. The drill tube provides rotation while the impact rod, fitted in floating suspension inside the tube, transmits impact energy and feed force. The flushing air passes between the tube and the rod through the bit rod to the front of the drill bit.

When the COPROD sections are joined, the impact rods stand on top of each other inside the drill tube. This means that the impact energy is directly transmitted to the rock without passing a single thread. This results in superior drilling performance and hole straightness, high energy efficiency and low wear and tear on components. Thanks to the unique double recoil dampening system of the COP rock drills, the rod ends remain in permanent contact, energy losses are almost zero, and drilling efficiency is maintained from start to finish of the hole.

During drilling operations, if the bit enters a cavity and drops down in its splines in the bit chuck, the Rig Control System (RCS) detects it and percussion is interrupted. Rotation is maintained, however, and percussion restarts automatically when the bit meets resistance again.

Water mist (a mixture of pressurized air and water) enters the bit via a center channel (Figure 2), which connects to the cylindrical surface in the bit rod. A small amount of water mist, containing a little oil, escapes via the splines in the chuck and the bit, and lubricates them. On its way up, the water mist travels between the smooth outside of the tubes and the hole wall, providing a constant cross section, and ideal conditions for flushing the drill cuttings. COPROD offers unique features for drilling holes fast and straight. And the more troublesome the ground becomes, the more this incomparable drilling system comes into its own.

Figure 2, COPROD drilling method with flushing of the drill cuttings.

Customer case

Simba COPROD at Pucobre, Chile

The goals

- Increase productivity and lower cost
- Better fragmentation
- Reduce boulder frequency
- Hole quality assurance
- Increase burden = 25% reduced D&B budget
- Reduce dilution – increase ore recovery
- Downstream process improvement
- Load and haul, crushing, etc.

Pucobre mine challenges

- Cost escalation
- Complex recovery mining
- Challenging rock conditions
- Demand for longer holes

Project challenges

- Change management
- Digital data follow up
- Root cause analysis

4 phase project

1 INSIGHT

KPI's

3 months (Nov 2022)
Quality assurance in place: measure angle of drill, collar position, in-hole deviation

2 CONTROL

2 months (Jan 2023)
Smooth operation,measurerments done

3 OPTIMIZE

2 months (Mar 2023)
Increase burden to +2,4 m, Bettter fragmentation, Reduced dilution to 5%. 2,4 m = 17% savings

4 IMPLEMENTATION AND FINE TUNING

9 months (Dec 2023)
Increase burden to +2,7 m, Testing boundaries. 2,7 m = 26% savings

The results

from +45 000 m of drilling

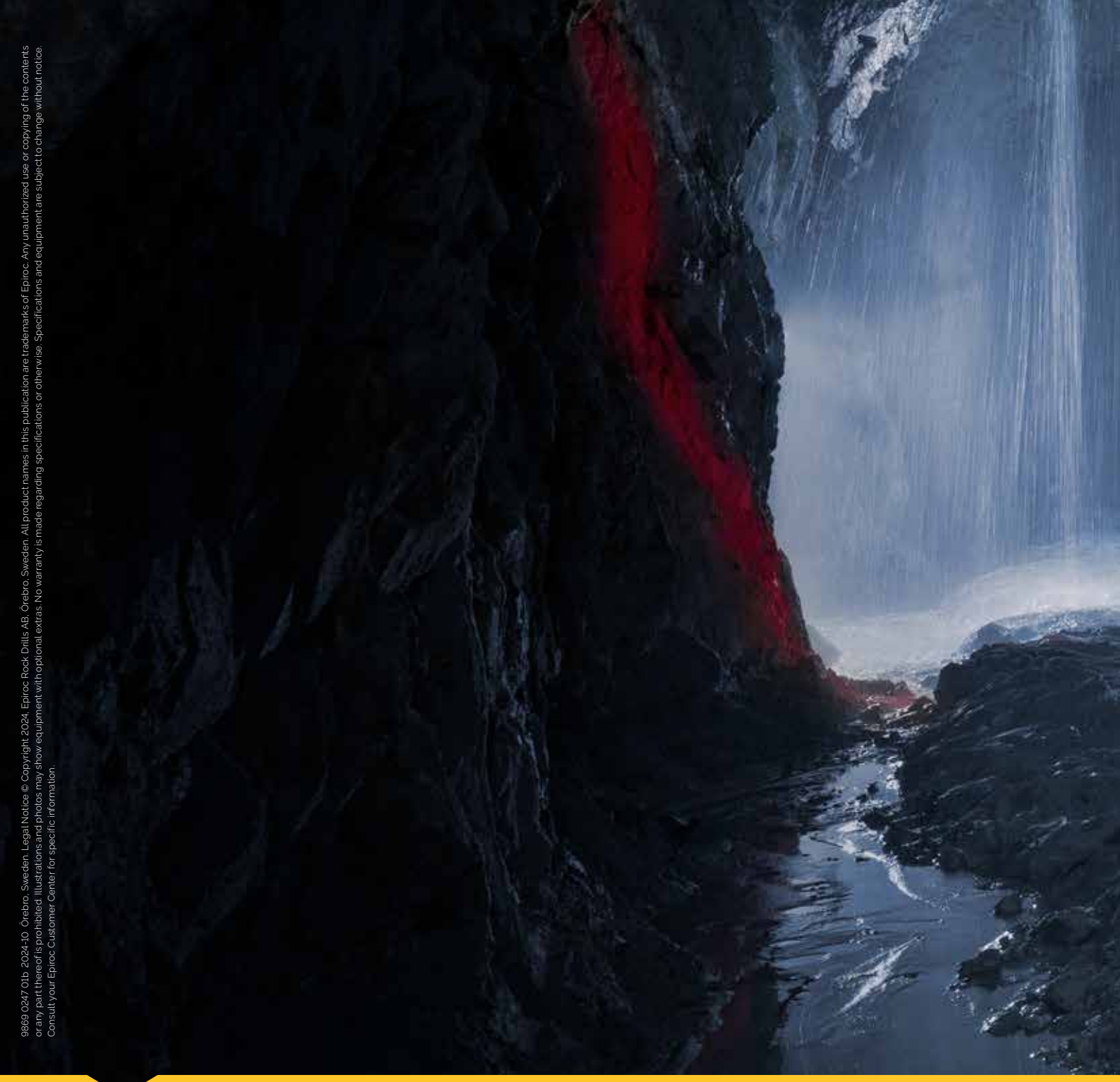
Improved hole quality
Superior precision in the drilling which gives optimal blasting results, even with increased burden from 2,0 m to 2,4 m. Less drilling and explosives that gives 19% less cost.

Sustainability
Better precision gives increased ore recovery, lower dilution and reduced drill induced damages. Reduced consumption of explosives due to increased hole spacing and burden.

Productivity
Increased penetration rate and precision gives many downstream benefits:
• Better fragmentation
• Less dilution
• Improved ore recovery

Total station navigation and Simba COPROD drill rig at Pucobre mine.

Boom position	Baseline: 2,63% Actual: 0,85%
Penetration rate (m/min)	Baseline: 0,78 Actual: 1,07
Drill precision (in-hole deviation)	Baseline: 9,85% Actual: 1,96%



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