Case Study
Maximising SAC MIK Throughput through Improved Fragmentation
Codelco Chuquicamata Mine, Chile

Site Profile
- Largest and deepest open pit copper mine in the world.
- Owned and operated by state-owned Codelco Mining, Chile.
- Located in Chile's Second Region, 1,600 kilometres north of Santiago.
- Total copper reserves of approximately 5.4 million tonnes.
- Production

A key geological challenge is the lack of stability in the west wall, which is next to a fault line that runs through the pit. Avoidance of wall collapses is critical.

Location of mine means equipment is subjected to extreme aridity, severe temperatures, high solar radiation levels and frequent strong static electricity.

Manuel Cortes ties in i-kon™ detonators. (see video under Case Studies at www.i-konsystem.com)

Mining Issues
- Mine consists of 7 different geological sectors and blast plans must be customized to each unique area.
- Typical blast is 100 holes x 12 1/2” diameter on a 7m x 9m pattern, producing about 250,000 tonnes of rock per shot, using a powder factor of 0.33 kgs per tonne.
- To increase safety and maintain highwall stability, blast size is being restricted and bench height reduced from 26m to 18m.

The Situation
- New SAG processing mill requires very specific fragmentation size to maximize output. Conventional mill also benefits from small, consistent particle size.
- Great depth of mine means steeper slopes, which affect haul truck efficiency.

Pit measures 4.5 km long by 3 km wide by 1 km deep.

A constant flow of haul trucks.
Technical Solutions

- Chuquicamata focused early on using electronic dets for improving fragmentation and pit wall stability, introducing them in 2000.
- They tried every type of electronic det on the market, carrying out extensive safety and operational tests.
- Chuquicamata first used i-kon™ in October 2002, and have now fully adopted it as their preferred system.
- The mine will carefully explore pattern expansion, increased blast size and potentially, steeper walls in the near future.

Demonstrated Benefits

- Consistent fragmentation size with i-kon™ has significantly improved crusher and SAG mill efficiency, and reduced wear and tear on loaders and haul trucks.
- Smaller rock size has reduced the amount and cost of mechanical and electrical energy required in downstream copper extraction processes.
- Increased vibration control has reduced blast impact on pit walls and contributed to overall pit stability.
- i-kon™ has reduced the time required to plan, tie-in, and fire blasts.
- Reduced powder factor saves on overall explosives consumption.

Testimonial

“The change to electronic detonators from conventional detonators was easy for us because we immediately saw the benefits that electronics delivered. When you get improved fragmentation it helps all the processes that come after the blast. Even the mining phase benefits because it is easier for the loaders to remove the muck and there is less damage to the haul trucks from large rocks. But the biggest savings are obtained in the later phases when you reduce the size of the material going to the crusher and grinder. This improves the entire downstream process by saving energy, mechanical energy and electrical energy, both of which are much more expensive than the chemical energy released by the explosives.”

Carlos Barros
D&B Superintendent
Chuquicamata

“The importance of optimum fragmentation in the processing of the ore is that it allows for better process efficiency, and therefore more volume through the concentration plants, and so in the end we get more finished copper. The i-kon™ System has a real impact on the shockwave interaction within the blast - and the improved blast design and the initiation delay sequences allow us to get better fragmentation.”

Jaime Villalobos
Blasting Unit Chief
Chuquicamata
"Several different kinds of electronic detonators have been used at Chuquicamata over an extended period. In fact, they have tried every electronic system that there is. They started with i-kon™ in October 2002, and have stayed with i-kon™ ever since, mainly because i-kon™ provided greater operational flexibility for Codelco’s miners."

William Tapia

Technical Consultant

Orica Chile

"Our people also had a lot of confidence with i-kon™ because they had seen the positive results at other global operations, and the successes achieved there. We were successful in delivering everything that we had promised: the smooth conversion from pyrotechnics to electronics, and all the benefits in terms of fragmentation, vibration, damage control, and expansion of the blast pattern. All that we expected to happen did happen. We delivered the results the mine expected and this was the most important thing for us. We were very pleased with the technical results we were able to achieve on their behalf."

Felix Torres

i-kon™ Product Manager

Orica Latin America