

DRILLING FOR OPENING SLOTS FASTER, SAFER AND MORE ACCURATE

The San Geronimo mine in Chile was facing the challenge of creating open slots with a high productivity in a safe manner. There is no other technology that is better than the Wassara DTH hammer when it comes to drilling a long hole rise, due to the fact of the straight holes, high productivity and low stress caused on the host rock.

Opening slots – as real challenge

The San Geronimo underground copper mine, located in Chile, was facing the same challenge as most underground mines – the ability to create open slots with a high productivity in a safe manner. The opening slots are the first holes to blast, creating a void that is used for the production blasting.

Previously, the staff at San Geronimo used the traditional air leg raise miner for the opening slots. A miner worked his way up the hole on ladders and drilled and blasted, cut by cut. This method was not very productive and posed a great hazard for the raise miner. To create one open slot with the dimension of roughly 1.2 m x 1.2 m and 20 m in length with this method it took roughly 28 days and 3-4 miners were required. In the search for alternative ways of drilling opening slots, the use of a box-hole rig was quickly eliminated due to the high cost and requirement of large development drives.

Long and straight holes needed

The ideal solution would be to create open slots with existing equipment and technologies in the production, like the drill rigs used for the long blast holes. This has been tried by many mines, but with unsuccessful results as the requirements of very straight holes couldn't be met. In a long hole rise, the holes are positioned very close to each other, sometimes as close as 20 cm. In these 20 meter long holes, it equals 1% of borehole deviation.

With the very tight spacing between the holes in a long hole rise it is important that the drilling process doesn't create or prolong existing structures and voids in the host rock. If this happens, the blast holes might get connected to each other with explosives during the charging process. If so, undesired initiation of the explosives will happen during the blasting sequence which is a great factor of having an unsuccessful blast. With conventional drilling technologies it is very hard to remain the holes parallel which is the key to achieve an successful blast of the long hole rise.

The Wassara solution

Wassaras water-powered DTH (Down-The-Hole) hammer enables very straight holes with less than 1% deviation in traditional lengths of long hole rises. The successful reference from the LKAB mines in Sweden, where the Wassara hammer is being used for long hole rises up to 35 m in length, made the choice easy for the mine.

The mine made some modifications to a rig (such as a rotation unit and breakout table) in order to utilize the Wassara DTH hammer.

The drill pattern of the long hole rise consist of 82 mm (3.25") blast holes and 127 mm (5") open void holes. The length of the long hole rises varies around 20 m and are 90 degree upwards and have about 70 degree side rotation.

CASE STUDY

DRILLING FOR OPENING SLOTS FASTER, SAFER AND MORE ACCURATE

The Wassara W70 hammer is used for the 82 mm (3.25") holes, while the Wassara W100 hammer is used for drilling the 127 mm (5") holes. It takes 3-5 days to complete one long hole rise with Wassara. Comparing it to the method they used before, that is a factor of 4-5 times as fast, still eliminating the hazards that comes with air leg raise mining.

The result

The mine itself did make a survey of the drill holes to measure the deviation, using the Reflex system as surveying method. All holes had less than 1% in deviation while many of them had close to zero. Up to this date, the mine have drilled 10 long hole rises and they require about 2 long hole rises a month to meet up with the rate of production. The rate of penetration in these formations were 0.8m/min with the W100 hammer and 1 m/min with the W70 hammer.

There is no other technology that is better than the Wassara DTH hammer when it comes to drilling a long hole rise due to the fact of the straight holes, high productivity and low stress caused on the host rock.



The W100 hammer



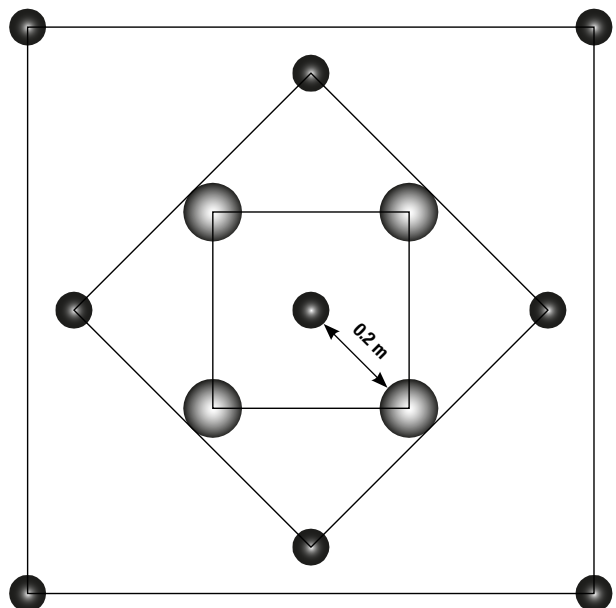
The W70 hammer



Drilling in action

Equipment used	
DTH hammer	Wassara W70
	Wassara W100
Drill bit	Ø 82 mm (3.25")
	Ø 127 mm (5")
Drilling fluid	Clean water
Drill rods	Wassara, 63.5 mm (2½")
	Wassara, 89 mm (3½")
Rig	Atlas Copco Boomer 281
Water pump	WASP 80 diesel
Borehole length	20 meters in average
Geologic formation	Sandstone and other rock types, with hardness of 135 MPa – 160 MPa

August 2015



The 1.2 m x 1.2 m drill pattern