THE AUSTIN ADVANTAGE

VEIN BLAST USING ELECTRONIC AND NON-ELECTRIC DETONATORS BREAKS MORE THAN 2,000 METRIC TONS

GENERAL INFORMATION

Location: Chihuahua State, Mexico

Project Type: Underground Gold and Silver

Products Used: Austinite 15, Emulex 1, Hydromite, E*STAR Detonators, Shock*Star Detonators, Hydrox U Emulsion, Red D GEM UG Equipment, and different weight boosters

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THE HISTORY

The mine is divided into two large sections. One of them is a Disseminated Ore Body. This deposit is currently mined from sub-level stopes using the long drilling fan mining method. Austin has loaded explosives in this section of the mine since 2017 with a permanent service operation.

The other area of the mine is a Narrow Vein Ore Deposit. Epithermal quartz veins are present and have variable lengths, thickness, orientation, and dip. For this reason, this deposit is currently mined with a variety of extraction methods, including long-hole blasting and cut and fill methods. The cut and fill mining method is used in the areas where the long hole techniques are not possible (for operational costs), or the mine does not have suitable development to access the ore body.

Drilling patterns for the cut and fill blasts involve around two hundred holes, each with a diameter of 48 mm (1.9 in) and length of 4.3 m (14 ft). The holes are distributed in rows (from one to four holes per row depending on the vein thickness) along the stope length. At the beginning of the stope, a burn cut is drilled to create an open face. The burn cut is detonated using E*STAR Detonators, and the production rows next to the cut are initiated using Shock*Star Detonators and detonating cord.

The Shock*Star Detonators and detonating cord are initiated by the last E*STAR delay in the burn cut. In some cases, misfires are caused by fly rock damage to the detonating cord and/or shock tube. This situation is more evident when the number of production holes is large, and the burn cut holes eject material towards holes where the detonating cord is exposed, between rows of holes.

THE GOALS

1. Minimize the dilution between vein blocks and blast the entire stope in a single event
2. Keep costs within a defined budget
3. Eliminate misfires and cut-offs (live explosives left behind)
4. Create an optimal free face for production rows
5. Keep fragmentation within required parameters

Fig. 1 Vein displacement

CUSTOMER **CHALLENGE**

For this blast, it was necessary to load and blast five hundred holes. The stope was divided into three sections. Each one consisted of a burn cut and a different number of production hole rows. This number of burn cuts was required because the geological faults displaced the vein in other parts of the stope (Fig. 1).

The mine required the minimum dilution between vein blocks but still required the whole stope to be blasted as a single event. The use of electronic detonators in all holes was not possible due to cost. The non-electric detonators involve using a detonating cord to initiate the Shock*Star Detonators to enable the correct blast timing. This request from the mine increased the risk of misfire, rock projection, and cuts in detonating cord and/or shock tube (due to the location and proximity of the burn cuts and production rows).

Fig. 2 Good performance of the burn cut

THE **AUSTIN** SOLUTION

To minimize the risk of misfire, E*STAR Electronic Detonators were chosen for the burn cuts and Shock*Star for the production rows. Electronic detonators allowed versatility in the timing design and using a longer time between burn cut holes generated better displacement and formation of the free face.

To ensure the continuity of the signal in the detonating cord trunk line, three electronic detonators were located in different sections of the detonating cord line with the same delay time as the initial initiation point. If the detonating cord is cut at any point, the line has two more paths as redundant initiation points.

These backup E*STAR Detonators are the same delay as the last burn cut blast hole. In this way, continuity of blast sequence and rock displacement is possible.

The connections between Shock*Star Detonators and detonating cord were made to minimize the risk of cutting the shock tube between detonating cord and hole collar. In addition, several trunk lines of detonating cord were used to ensure at least two initiation paths to every detonator.

THE **OUTCOME**

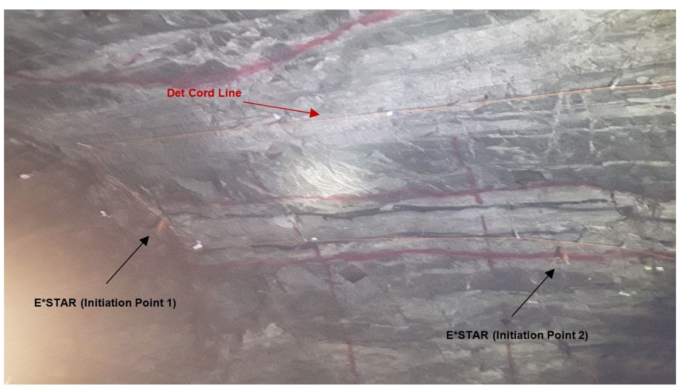

Fig. 3 Connection between blastholes and detonating cord

1. No misfires or live explosives left at any point along the stope
2. All detonators (electronic and non-electric) were started and performed correctly
3. The burn cuts had very good performance generating an optimal free face for the production rows (Fig. 2)
4. This blast broke more than 2,000 metric tons of high gold and silver content mineral with a single firing signal
5. The fragmentation obtained was within the required parameters by the client (P80 = 5in – 10in)

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AUSTIN POWDER

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