Boretrak Used to Detect Hole Deviation & Toe Burden

Background

REDUCING COAL LOSS FROM BLASTING

This Western surface coal mine is a combination truck/shovel, and dragline operation. Vertical holes are drilled in the truck/shovel areas and 30° from vertical holes are drilled in the cast blasting areas.

Holes in the cast blast patterns are from 150 to 200 feet deep. The borehole diameter is 12.25 inches. The face is profiled using a 3-D laser profiler. This aids in placing front row holes at the proper burden from the face. Holes are drilled to within 15 feet of the top of coal. This is to protect the coal from damage from the blast. Following a cast blast, the new highwall is dug with a large track hoe to the dragline bench elevation. It's dug at 30° using GPS to ensure the proper slope. From there down, the wall is cut with a dozer without the aid of GPS. Sometimes the face movement near the bottom of the bench seems less than normal. Sometimes there is coal damage below the front row of the cast.

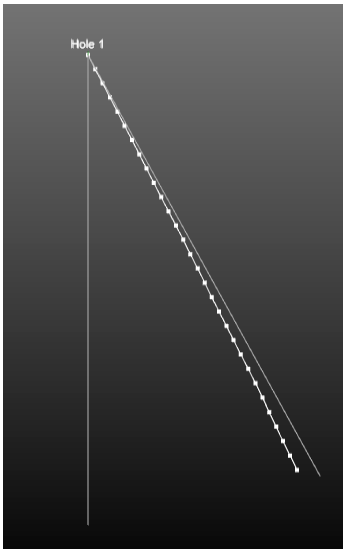
DynoConsult was called in to help reduce coal loss from blasting and determining why there were inconsistent results of face movement.

There are several factors that can contribute to this problem. Some may not have an easy solution, but could be minimized by determining some of the dimensions that are taken for granted, such as face burden and borehole deviation.

Technology Applied

A RENISHAW CABLED BORETRAK WAS USED TO DETERMINE IF THERE WAS ANY BOREHOLE DEVIATION

The 3-D face profiles often show that the burden in the bottom 50 feet of the face is more than the design calls for. This is because the dozer does not cut the wall at 30° as well as the track hoe does. The burden at the bottom of the hole may be as much as 10 feet more than designed. The Boretrak probe was lowered to the bottom of the hole and a reading was taken every 2 meters as the probe was pulled up the hole. The data collector recorded the position of the probe, depth, angle, and azimuth of the hole.



Results

ALL HOLES SHOWED THAT THEY WERE TENDING TO BEND BACK TOWARD VERTICAL AS THE DEPTH INCREASED

In holes that were approximately 150 feet deep, the bottom of the hole had deviated about six feet. Deeper holes would have been even more. This increased the toe burden on those holes by 6 feet. If the face was not dug to the designed slope, the excess burden would be even greater. That much excess burden could cause poor face movement and coal damage due to increased confinement at the bottom of the hole.

Next Steps

ENSURE THAT THE HIGHWALL IS DUG TO THE PROPER ANGLE FROM TOP TO BOTTOM

While there is nothing that can be done about the borehole deviation, the front row burden could be decreased to compensate for the increased toe burden.