Yielding Support Systems in Deep to Ultra-Deep Level Gold Mining

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ABSTRACT:

The deep level gold mine has a very thick orebody at a depth of 3000m. In order to apply massive mining techniques, de-stressing is imperative. De-stressing is accomplished by cutting a series of overlapping, 2.2m high horizontal slots across the reef. Although the minor span of each slot is approximately 100m, stresses are extremely high due to the presence of abutments. Seismicity is also frequent, however, at current mining rates, the magnitudes are generally less than the neighboring mines and what occurred in the past during conventional mining at the mine. In order to protect workers from the effects of smaller seismic events, a yielding system with good areal coverage has been developed. This system consists of weld-mesh (100 mm apertures and 5.6 mm strands) and 2.4m long, yielding anchors. The strong mesh allows the installation to be made at 0.5m away from the advancing face without significant damage by the blast. A tendon pretension of 30kN ensures an active support system at the installation, and during a seismic event, 30kJ/m2of energy can be absorbed. The anchors are supplied by two companies, one with the yielding element at the collar and the other at the toe of the hole. The advantages and disadvantages of the two different yield-systems are discussed in the paper.