



Cut-back in ounces at TauTona in the interests of safety

TauTona mine situated in AngloGold Ashanti's West Wits area – employs some 5,000 people and currently operates at approximately 3,500m below surface, making it the deepest operating mine in the world. The R1.2bn below 120 Level Carbon Leader project will take the operating level down to 3,900m below surface. This project is in pre-sink stage and full sinking will start halfway through 2009.

A major safety review was undertaken at the mine in 2007, following a tragic increase in the number of fatalities in 2006 (16, compared with four in 2005). Regrettably there were five fatal accidents in 2007).

The review has been multi-faceted, in line with the company's approach to safety.

During the year, the review of mining the shaft pillar area continued (the shaft pillar is the area surrounding the main shafts). Rock engineering staff headed leading-edge rock engineering and seismic studies to address the issue. Shaun Murphy, Principal Rock Engineer and Lourens Scheepers, Rock Engineering Manager at TauTona Mine, were able to integrate the cumulative

effect of seismic events in the shaft pillar boundary area into the numerical model used to simulate the stress changes on the shaft pillar infrastructure excavations. From this integrated model two areas were identified that influenced the stability of the shaft pillar infrastructure and in these areas has ceased mining.

A novel way of representing the seismic response to production in graph format was also developed to simplify back analysis of mining related seismicity. This helped identify high-risk situations. A reduced mining rate is now used to manage the risk in these identified areas, including mining in the shaft pillar area.

Mining was also stopped in those areas that could influence the stress field in the important infrastructure excavations in the shaft pillar. These areas were identified as the 97 winder level chambers and 100 level fridge plants.

Arising from the review, the rate of extraction per panel per month, and the total volume extracted from the shaft pillar area, were reduced by some 39,000m² and 3300kg of gold (106,097 ounces) for the 2007 to 2009 period. Slower mining allows the rock mass to dissipate most of the mining-related energy through non-seismic processes, such as heat, fracturing and noise. The active tracking of designed mining, as opposed to the actual rock mass response to mining, helps to establish trends and to redesign mining solutions. The redesign process and reduction in mined volume and gold recovered are in line with the primary goal of safe mining in AngloGold Ashanti.

Another step in the safety review involved a change in mining method, from longwall to sequential grid mining, in some areas of the mine. Where mining is carried out through longwall method, development is always behind the moving face in the low-stress stope shadow. Sequential grid mining involves pre-development of the ore body and so tunnels are developed in higher field stress controlled by a regular grid of reef pillars. This allows for advance knowledge of dykes, faults or other geological features.

"Whilst well proven in the Ventersdorp Carbon Reef (VCR) environment at Mponeng Mine, it is relatively new to the Carbon Leader Reef (CLR) at TauTona. Good progress has been made with the implementation of the sequential grid layout here. On 104 level, the leading development ends have now mined through the mining abutment" says Johan Laas, Manager Rock Engineering. "This created an important opportunity to gain more information on the possible difficulties of maintaining stability in these layouts. While negotiating the high-stress



The cut-back in ounces at TauTona in the interests of safety *continued*

abutment and developing through a major dyke, extensive support systems in the form of steel sets and voidfill (aerated cement placed behind the sets) had to be installed to maintain stability. This support system has been shown to absorb seismic energy and control tunnel deformation during seismic episodes in our other deep-level mines. This experience is expected to prove extremely useful in similar deep mining projects where tunnels extend beyond stopping abutments and through geological discontinuities.”

Support systems in use at TauTona are generally considered industry best practice, with 100% of mine support consisting of backfill, resulting in more than 75% of area filled. (Backfill refers to the use of waste material to support the hangingwall after the removal of ore from a stope.) The safety review team did, however, identify a potential problem, in that backfill-to-face distance was compromised during dip-gully establishment. (Support needs to be as close to the face as possible.) An alternative dip gully support system was tested, which incorporates steel reinforcing in the backfill placed in multi-modular bags, in place of the traditional timber packs. The advantage of this system, which is now being rolled out to the entire mine, is a major reduction in backfill-to-face distance while establishing a dip gully.

These efforts have borne fruit in improved safety results. In 2007, rockburst and rock fall accidents respectively reduced from 12 and two in 2006 to one and two in 2007. Falls of ground are either seismic-related or gravity-based: seismic-related falls of ground occur when energy is released within the rock mass.