Rockburst risk management to eliminate injuries and fatalities during mining operations

Abstract (submitted to Mine Health & Safety 2006 Conference)

In 2005, approximately fifty people were fatally injured in rock fall accidents in South African mines, approximately thirty died in rockbursts. Averaged over the past ten years, rockburst related fatality rates were approximately half those of gravity induced falls of ground with an overall trend of slow decrease in total numbers. As a rule of thumb, for every rock related fatality roughly twenty accidents occur.

The industry, especially the deep level, tabular hard rock mines, has succeeded in developing knowledge and technology to grow our understanding of mining induced seismicity. It largely relied on SIMRAC funded research, in place since 1993, to develop basic concepts and processes that allow us to monitor seismic hazard, record and analyse seismic data and integrate, as a matter of routine, seismicity, production, geology and mine design.

This country has developed expertise to the extent that natural earthquake research is being conducted locally by agencies from the US, Germany and Japan. Yet, our progress in reducing seismicity related losses is still limited, perhaps with the notable exception of multiple fatalities. Mine seismology in the year 2006 is marked by apparent contradictions: Over three hundred mining areas are analysed daily for short-term trend changes to detect rock mass instability, but seismic event prediction is far from reliable. Network sensors can detect ground velocities down to $10^{-6}\text{m/s}$, just above the background noise level, but many events recorded by mine networks are not accurately quantified. And as the understanding of the relationship between seismicity and the inducing mining system grows, the pool of expertise among mine seismologists and rock engineers is further shrinking.

Despite these difficulties rockburst risk management offers a range of tools to production managers, rock engineers, mine planners and geologists. The majority are based on seismic hazard quantification coupled with subsequent hazard mitigation, loss reduction and contingency planning. Seismic hazard reduction relies on successful integration of seismic information with other disciplines, the development of suitable procedures and the adherence to best practice, the formulation of which is subject of a current SIMRAC project.

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