



Gold mining industry commissions study into seismicity and rockbursts

Events over the past two to three years have highlighted the frequently fatal and disastrous consequences of seismic activity and rockbursts in deep-level underground mining operations. Most serious in terms of scale, was the earthquake in the Stilfontein area in March 2005, which registered 5.3 on the Richter scale and which seriously affected the mining operations of DRDGold. More recently, rockburst and seismic activity occurred at AngloGold Ashanti's TauTona in 2006/7 where there were 14 rock-related fatalities in 2006 and three in 2007. These two events led to the conclusion that more attention was required to manage mine seismicity.

The Minister of Minerals and Energy Buyelwa Sonjica subsequently called for a 'mini-indaba', which was held in Carletonville on 7 September 2007 at which the mining industry, labour organisations and government met to discuss the current state of safety on mines, with particular regard to seismicity and rockbursts. Following on from this, the Gold Producers' Committee (GPC) of the Chamber of Mines, under the chairmanship of Robbie Lazare (now Executive Vice President-Africa at AngloGold Ashanti), commissioned a study into the current state of knowledge of seismicity and rockbursts.

Says Robbie Lazare, "The intention is that this study, which includes both local and international experts, will provide insight and make recommendations that will enable the industry to better manage the risk of seismic events and rockbursts so as to protect the lives of employees and to safeguard property."

"While South Africa is a world-renowned leader in ultra-deep level underground mining, we must become a world leader in safe underground mining too."

The two overall aims of the study are:

- To compile a review of seismic and rockburst safety on South African gold mines; and
- To identify opportunities to minimise the risks arising from seismicity and rockbursts as much as is humanly possible.

This review will be guided by the following strategies:

- To reduce the magnitude, potential for damage, and/or the incidence of rockbursts, in order to control the source of the hazard and if possible to predict seismic events;
- To ameliorate the effects of rockbursts, that is to absorb/deflect the energy in such a way that people are not harmed; and
- To reduce the exposure of people to rockbursts.

In particular, in reviewing mine safety, the study will research and summarise the status of knowledge and technology on seismic activity and rockburst safety, both locally and internationally, people skills and management systems around this, and the actual implementation of the relevant knowledge, technology and systems. Particular attention will be paid to identifying the root and contributory causes of seismic and rockburst accidents. The focus will be on accidents that have occurred in the past 10 years and the study will consider whether a range of factors including the depth of mining, mining methods, the type of reef being mined and geological conditions, among others, influence the risk of seismic activity to show that seismicity does not only occur in deep-level gold mines.

This study has been commissioned by the Chamber of Mines and will be a collaborative effort by the gold mining companies which are members of the Chamber as well as DRDGOLD. The study is to be conducted under the chairmanship of Bobby Godsell, former CEO of AngloGold Ashanti.

An independent consulting company has been commissioned to conduct this study so as to ensure that the report produced is objective and scientifically sound. It will manage, oversee and co-ordinate the study.



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Following on from the commissioning of this study, the Chamber of Mines' Rock Engineering Technical Committee (formerly the Group Rock Mechanics Engineers Working Group) has been reconstituted and will provide the technical review for the study and liaise between the consultants, the GPC, and the industry. The study, which is to be funded by the GPC through the Chamber of Mines, has already begun and is expected to run for six months.

Brief overview of seismicity today

Internationally, seismologists are in agreement that the timing, magnitude and exact location of a seismic event cannot be predicted with any certainty. Seismologists know that there will be earthquakes and seismic events in California and in Japan, but they cannot say with any accuracy when these will occur, how large these will be or exactly where they will occur.

Deep-level mining as is found in South Africa involves working in the earth's crust where there is naturally occurring seismicity (which is very simply the release of energy in the rock mass). This occurs as, globally, the continental plates shift and in reaction to changes in the force fields (localised energy) in the earth's crust. In South Africa, this seismicity is monitored and recorded by the Council for Geoscience, which is also part of the global seismic monitoring network.

Furthermore, in deep-level mining, as the ground/rock mass reacts to changes in the energy levels or force fields, one of the questions is: how much of the changes in these energy levels are as a result of mining activity and how much as a result of naturally occurring changes in the force fields. The entire sub-continent of Africa is subject to seismicity and the question which research in this field is attempting to address is the role of mining and the controls which are required to prevent loss of life and damage to property.